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GENERAL

ATOMIC POWER

6561
UTILIZATION OF REACTOR WASTE PRODUCTS. E. Glueckauf (Atomic Energy Research Establishment, Harwell, Berks, England). Research 8, 314-23(1955) Aug.

The different types of decay of reactor waste products, the properties of individual fission products suitable for isolation, and the extent of research activities on the development of radiation facilities in the future are discussed. It is concluded that the so-called waste products of power reactors and the radiations emitted from them, far from being waste, will prove to be valuable assets. (auth)

BIOLOGY AND MEDICINE

6562 AF-SAM-55-40
Texas. Univ., Austin. Radiobiological Lab. and School of Aviation Medicine, Randolph AFB, Tex.
A HIGH LEVEL Co^{60} IRRADIATION FACILITY. John A. Auxier. June 1955. 13p.

A facility for the exposure of small animals to intense radiation fields was designed and built. A 1,200 curie Co^{60} source permits the exposure of rats to dose rates of 75 to 4,000 roentgens per minute. (auth)

6563 UCRL-3078
California. Univ., Berkeley. Radiation Lab.
AGING: A THEORY BASED ON FREE RADICAL AND RADIATION CHEMISTRY. Denham Harman. July 14, 1955. 5p. Contract W-7405-eng-48.

It is suggested that the changes in living cells which are produced by irradiation and those changes which occur spontaneously have a common source—the OH and HO_2 radicals. Methods of testing this theory are outlined. (C.W.H.)

6564
MECHANICAL RESPONSE OF DIFFERENT PARTS OF A LIVING BODY TO A HIGH EXPLOSIVE SHOCK WAVE IMPACT. Carl-Johan Clemedson and Carl Olov Criborn (Research Inst. of National Defense, Sundbyberg, Sweden). Am. J. Physiol. 181, 471-6(1955) June.

Results are summarized from a study of the mechanical response of different parts of a living rabbit body to the impact of high explosive shock waves. The relationship between the response of a tissue and its susceptibility to blast damage is discussed. (C.H.)

RADIATION EFFECTS

6565 AMRL-195
Army Medical Research Lab., Fort Knox, Ky.
THE USE OF ULTRAFRACTIONATED RADIATION IN THE STUDY OF RADIATION-INDUCED REACTIONS. J. G. Kereiakes, R. H. Hodgson, and A. T. Krebs. June 28, 1955. 13p. AMRL Project No. 6-59-08-014, Subtask: EFFECTS OF IONIZING RADIATION.

Ultrafractionated ultraviolet irradiation does not damage yeast cells to the same extent as does continuous irradiation. Definite minima in the per cent of yeast cells damaged were found for single exposure times of 0.024 sec and 0.0025 sec, corresponding to radiation pulses of 13.8/sec and 133.3/sec, respectively. It is assumed that these minima are related to the time existence of some radiation-induced chemical reactions. The magnitude of the observed minima may indicate the quantitative and/or specific importance of the particular reactions. (auth)

6566 NM-007-081.03.06
Naval Medical Research Inst., Bethesda, Md.
THERMAL RADIATION BURNS IN RABBITS. III. THE USE OF RADIOACTIVE PHOSPHORUS (P^{32}) TO MEASURE THE SEVERITY OF RADIANT ENERGY BURNS TO THE RABBIT EAR. C. M. Neil. Dec. 31, 1954. 23p.

Twenty adult albino rabbits were subjected to radiant energy burns of a flash type to one ear while under ether anesthesia. The burns were produced by a focussed group of 43 photolamps and were exposed for various durations from 0.2 to 2.4 seconds. Intensity was constant at approximately 7.5 cal sec^{-1} cm^{-2}. Immediately after exposure, each rabbit was injected intracardially with 200 μc of P^{32} as phosphate. Determinations of radioactivity in each ear were done daily by surface counting methods for five days after exposure. The ratio of radioactivity in the exposed ear to that in the control ear for each animal gave the expression Activity Ratio (AR), which averaged for the five day period, gave Severity Ratio (SR). A time plot of all AR's suggested that the value of AR might be related to the gross physical appearance of the exposed tissue. The exposed sites could be grouped on the basis of physical appearance into three groups similar to the classical three degrees of burn. The Sr averages for each group indicated each to be statistically distinct. (auth)

6567 USNRDL-TR-20
Naval Radiological Defense Lab., San Francisco.
THE RELATIVE BIOLOGICAL EFFECTIVENESS OF FAST NEUTRONS IN MICE. R. E. Carter, V. P. Bond, and P. H. Seymour. Nov. 17, 1954. 22p. Project NM-006-015. (AFSWP-759)

The 60-inch Crocker Laboratory cyclotron was used to irradiate mice with a neutron beam of 9 Mev mean energy, with 93% of the neutron population between 3 and 20 Mev. The relative biological effectiveness (RBE) of the fast neutrons, compared to 250 kvp x rays, was determined using reduction of spleen, thymus, and gut weights, and mortality as biological endpoints. RBE values obtained for these endpoints were 1.7, 1.5, 2.3, and 1.6, respectively. The results compare closely with those obtained by other investigators using monochromatic 14-Mev neutrons, thus indicating that probably no marked variation in RBE over

the high-energy neutron range employed exists for the test systems used. (auth)

6568

THE PROBLEM OF VARIABLE RADIOSENSITIVITY. D. Hofmann. Strahlentherapie 97, 231-8(1955) June. (In German)

Considerable diversity of opinion with respect to the differences in the electivity of high-energy radiations as compared to that of conventional roentgen rays inspired this cumulative report on the literature on the subject. The importance of absolutely equivalent experimental conditions is stressed, with respect to the integral doses. It is imperative to exactly distinguish between qualitative and quantitative differences of effect. Experiments on ascitic tumors in mice have confirmed the existence of a qualitative difference in the effects produced by the above mentioned radiations. The investigations to date seem to indicate that high-speed electrons and ultrahard roentgen rays have a greater therapeutical electivity than hard roentgen rays. (auth)

6569

THE RESPIRATION OF THE EPIDERMIS AFTER EXPOSURE TO IONIZING RADIATION. W. Gahlen and G. Stuttgen. Strahlentherapie 97, 259-65(1955) June. (In German)

6570

BLOOD HISTAMINE LEVEL AND SKIN ERYTHEMA DETERMINATIONS FOLLOWING EXPOSURE TO SINGLE DOSES OF X RADIATION. L. Koslowski, H. Poppe, and E. Walther. Strahlentherapie 97, 266-71(1955) June. (In German)

The authors examined the histamine level in the blood of 20 individuals submitted to a single roentgen irradiation of 400 r. In 18 persons they determined an increase in histamine of 45 to 400 γ per liter, respectively of 33 to 253%. No formation of erythema was observed. It is assumed that histamine is formed from histidine or by decomposition of cells in the skin. (auth)

6571

THROMBOCYTOPENIC PURPURA IN X RAY TECHNICIANS. A. Böhme and Oberste-Berghaus. Strahlentherapie 97, 292-6(1955) June. (In German)

As a result of continued duty as assistants in an x-ray establishment, two girls had a slight attack of thrombopenic purpura which disappeared upon interruption of their work. They, however, relapsed when resuming their duty and are continuously suffering from a slight thrombopenia. (auth)

6572

COLIBACILLI AS BIOLOGICAL INDICATORS OF RADIATION DOSAGE. Hubertus Böttcher. Strahlentherapie 97, 403-17(1955) July. (In German)

The author represented by curves the damages done to colibacilli by roentgen rays of 60 to 180 kv. His curves correspond to the results found by previous researchers as well as to the target theory. On the basis of his own investigations with a phantom, the author discusses the possibilities and limits of using colibacilli for biological measurements of the dose. (auth)

6573

INJURY TO THE HEMATOPOIETIC SYSTEM BY SMALL DOSES OF RADIATION. O. Henn and F. Leibetseder. Strahlentherapie 97, 435-43(1955) July. (In German)

6574

EFFECT OF X-IRRADIATION AND CHOLINE ON THE RETICULO-ENDOTHELIAL SYSTEM OF THE RAT. N. R. Di Luzio (Bradford Hospital, Penna.). Am. J. Physiol. 181, 595-8(1955) June.

The blood clearance and organ distribution of colloidal radioactive gold was studied in normal, choline treated, and whole body x-irradiated anesthetized rats. Treatment with choline for a period of 3 days resulted in an increased phagocytic velocity and a more efficient removal of the colloid. The tissue distribution of radiogold was unaltered. The injection of colloidal Au^{198}, followed immediately by whole body irradiation, produced a marked reduction in liver uptake of gold. At no time following irradiation was over-all phagocytic function, as indicated by the rate of removal of colloidal gold from the vascular system, impaired. The distribution of radiogold in liver, lung and spleen was found to be altered in varying degrees and directions at various periods following total-body x irradiation. (auth)

6575

CERTAIN EFFECTS OF IRRADIATION AND CHEMOTHERAPY ON CELLULAR DIVISION AND DIFFERENTIATION. Nathan B. Friedman, James A. Sargent, and Eileen Drutz (Cedars of Lebanon Hospital and Univ. of Southern California, Los Angeles). Cancer Research 15, 479-84(1955) Aug.

Analysis of the reactions produced in tissue by irradiation or the administration of chemotherapeutic agents reveals that such factors do more than merely interfere with cellular division. Some modalities inhibit the completion of mitosis in cells with the capacity of multiplication, some interfere with premitotic nuclear metabolism, and others inhibit an earlier cytoplasmic phase of synthesis. A comparable interference with cytoplasmic synthesis and an inhibition of differentiation are exercised by some of the drugs on the somatic cells which lack the ability to divide, while irradiation in therapeutic doses and other chemical agents do not interfere with differentiation. Although tumors in general are presumed to arise from reserve cells, spontaneous differentiation occurs not uncommonly. The possibility of enhancement of the tendency to differentiate is a relatively neglected but important effect of treating neoplasms by irradiation and selective chemotherapy. (auth)

6576

THE EFFECT OF X RADIATION ON THE GENERAL MITOTIC ACTIVITY AFTER VARIOUS INTERVALS. Annemarie Grossmann. Oncologia 8, No. 3, 259-72(1955). (In German)

Xenopus larvae of 12-mm length were irradiated with a dose of 500 r, killed after various intervals, and the mitotic activity of the tissues of the whole animal examined. The mitosis was diminished after 2 hours, completely stopped after 6 and 12 hours, recommenced in all organs after 24 hours, increasing appreciably above normal in the gills, and diminished again after 48 hours. Abnormalities were found 2, 24, and 48 hours after irradiation, sometimes occurring in cells, which, at the time of irradiation, had not been in mitosis. (auth)

6577

THE EFFECT OF X RADIATION ON THE LARVAE OF XENOPUS. Alice Höhn. Oncologia 8, No. 3, 273-89(1955).

After irradiation of the regenerating tail tip of the larve of Xenopus Laevis Daudin, it was found that all animals showed a quite normally differentiated regenerat. Degener-

ation commenced on the 3rd to 5th day after irradiation and finally caused the death of the animal on the 15th to 20th day. (auth)

6578

HETEROLOGOUS TRANSPLANTATION OF TUMORS AFTER PRE-TREATMENT WITH RADIOISOTOPES. W. Bollag and Cl. Meyer. Oncologia 8, No. 3, 300-9(1955). (In German)

Experiments with heterologous transplantation of the mouse Crocker sarcoma on young rats are reported. Pretreatment of the rats with the radioactive isotopes P^{32} and Au^{198} leads to the development of heterologous tumors. After a long interval between the injection of the radioactive isotope and the heterotransplantation, the tumors grow better than after a short interval, and after intraperitoneal application of Au^{198} they show better growth than after intravenous administration of Au^{198}. (auth)

6579

LATENT CHANGE IN ERYTHROCYTES AND EXPERIMENTAL CANCER. Thilde Eilers. Oncologia 8, No. 3, 309-20(1955). (In German)

By means of special after-staining of vital preparations, it was possible morphologically to demonstrate damage to the erythrocytes of the circulating blood a short time after total x-ray irradiation and also after local irradiation of the peripheral blood in rats. After x-ray irradiation with high doses a latent change in the erythrocytes commenced which, with individual differences, was not always reversible when stopping the irradiation. A relationship between latent erythrocyte changes and tumour development after x-ray irradiation could be demonstrated. A similar relationship had been shown previously in experiments with rats to which 4-dimethylaminoazobenzol or benzpyren was applied. (auth)

RADIATION HAZARDS AND PROTECTION

6580

MODIFICATION OF THE RADIATION-INDUCED INCREASES IN PHOSPHATASE ACTIVITY OF HEMATOPOIETIC TISSUES BY CHEMICAL AGENTS. Donald F. Petersen and Kenneth P. Du Bois (Univ. of Chicago). Am. J. Physiol. 181, 513-18(1955) June.

p-Aminopropiophenone (PAPP), cysteine and mercaptoethylamine administered prior to irradiation caused reductions in the extent of increased adenosine triphosphatase and 5-nucleotidase activity of the spleens and thymus glands of rats. Mortality studies demonstrated that the protective capacity of each compound coincided with its ability to diminish increased phosphatase activity with PAPP being the most effective of the agents tested. Greater improvement of survival and reduction in phosphatase activity was observed after the administration of a combination of PAPP plus mercaptoethylamine than with either agent alone. The results of the present study indicated the qualitative similarity of the three chemical agents in their ability to reduce radiation damage to the hematopoietic tissues. This similarity suggests common or closely related mechanisms of action for these protective agents. The results of this study indicate the potential usefulness of adenosine triphosphatase and 5-nucleotidase assays for evaluating the efficacy of chemical agents in protecting hematopoietic tissues from radiation damage. (auth)

6581

RESEARCH ON BIOLOGICAL PROTECTIVE AGENTS. PART X. OXYGEN REDUCTION PROCEDURES IN RADIATION INJURIES AND PROTECTION FROM RADIATION. H. Langendorff, R. Koch, and U. Hagen. Strahlentherapie 97, 218-30(1955) June. (In German)

Roentgen irradiations of living yeast and bacteria have shown that irradiations in vivo do not induce changes in the cytochrome system. Irradiations of mice have proved that the protective effect produced by cysteine and glutathione is not due to the redox potential of these substances. Thioglycollic acid, dialuric acid, iso-propyl alcohol and xanthin are ineffective as redox substances. Within the range of carbohydrate metabolism, the protective effect of pyruvic acid and of d-ribose is particularly striking. Lactate, acetate, and fructose are ineffective. (auth)

6582

PROBLEMS OF RADIATION PROTECTION ASSOCIATED WITH THE USE OF RADIOACTIVE ISOTOPES. Hermann Muth. Strahlentherapie 97, 246-58(1955) June. (In German)

The introduction into therapy of artificial radioisotopes has increased the scope of problems relating to the protection against the damaging influence of radiations. Obligatory values for the admissible doses of the various radiations emitted by radioisotopes, serve as a basis for speculations and calculations with respect to the protective measures. The author consolidates in tables and discusses the figures set up on a provisional basis on the occasion of the 1953 International Conference of Radiologists in Copenhagen. Particular reference is made to the new unit of dose, the rad, introduced during that conference. The amount of radiant energy acting on the critical organ is decisive for the estimation of the admissible quantities of radioisotopes to be introduced into the body. The figures, presently binding with respect to the most important radioisotopes used for therapeutical purposes, are indicated. The second part of the paper deals with the problems of practical protection against radiations. (auth)

6583

THE EFFECT OF FOLIC ACID AND VITAMIN B_{12} ON THE BLOOD FORMATION IN IRRADIATED GUINEA PIGS. Dietrich Mücke, Adolf Morczek, and Werner Mischel. Strahlentherapie 97, 473-88(1955) July. (In German)

The author irradiated 56 guinea pigs with 250 r each and studied the protective effect produced by folic acid and vitamin B_{12} on the hematopoietic system. Regular examinations of the blood picture over a period of several weeks proved that both vitamins are capable of protecting against the damaging effect of roentgen rays. These vitamins cause the absolute leucocyte and erythrocyte values to drop more slowly. The numerical values of the average minima of the corpuscular constituents of the blood proved to be higher as compared to the non-treated controls. The most favorable results were obtained with folic acid and its administration prior to the irradiation produced the best effect. Combined application of both folic acid and vitamin B_{12} did not result in a summation of the therapeutic effects. (auth)

RADIOTHERAPY

6584 AECU-3012

Minnesota. Univ., Minneapolis.

STUDIES IN METHODS IN INSTRUMENTS TO IMPROVE THE LOCALIZATION OR RADIOACTIVE MATERIALS IN THE BODY WITH SPECIAL REFERENCE TO THE DIAGNOSIS OF BRAIN TUMORS, AND THE USE OF ULTRA-

SONIC TECHNIQUES. Final Progress Report [for] July 1, 1952 to June 30, 1953. Aug. 1955. 67p. Contract AT(11-1)-41.

An evaluation is presented of results obtained employing a simultaneous counting technique for isotopic encephalometry. Results are compared with those obtained with a single scintillation counter. Preliminary results are presented from an investigation of the use of ultrasonics as a possible biological diagnostic tool. Problems associated with the technique are discussed, ultrasonic echo-ranging equipment is described, and data are presented from measurements of the critical angles of sound reflection for Al, Pb, and lucite, measurements of the maximum depth of penetration of sound in tissue, and determinations of the biological effects of ultrasonics. A high-power ultrasonic driving unit constructed for the purpose of assaying biological damage is described briefly. (C.H.)

6585 AECU-3061

New York Univ., New York. Post-Graduate Medical School and New York Univ., New York. University Hospital.

STUDIES OF THORIUM X APPLIED TO HUMAN SKIN. IV. CLINICAL AND AUTORADIOGRAPHIC FINDINGS FOLLOWING THE INTRODUCTION BY IONTOPHORESIS. Paul Fleischnajer and Victor H. Witten. [1955?]. 13p. Contract AT(30-1)-1535.

The technical details of controlled experiments with iontophoresis of thorium X solutions are described. Experiments carried out on living human skin in situ demonstrate that the iontophoresis of weak solutions of thorium X will increase its biologic effects as judged by erythema and pigmentation, and cause greater penetration as shown by autoradiography. The possible relationship between increased penetration of thorium X and increased clinical biologic effects is discussed. Some possible clinical applications of the iontophoresis of thorium X to enhance its therapeutic effectiveness are mentioned. (auth)

6586

THE INTRAUTERINE APPLICATION OF RADIOCOBALT BEADS. W. Bickenbach, H. Gartner, and U. Zoeppritz. Strahlentherapie 97, 188-93(1955) June. (In German)

On the basis of measurements performed on a model, the authors determined the isodoses for the intrauterine application of Co^{60} pearls. If conventional radium doses are used as a basis, then the period of irradiation can be sensibly reduced. Control measurements in situ at the bladder and the rectum have shown that the doses do not exceed the tolerance limit of these organs. Attention is drawn to the protection of the bladder by tamponade. (auth)

6587

RADIATION TREATMENT IN UTERINE BLEEDING. H. A. Künkel, H.-J. Schmermund, and R. Struckmann. Strahlentherapie 97, 194-201(1955) June. (In German)

Rubber pearls, emitting β rays, of 6 mm diameter and a central borehole of 1 mm inside width, were prepared by homogenous distribution of radioactive strontium sulfate (Sr^{90}/Y^{90}) in rubber. Their suitability for intrauterine β-ray therapy of benign changes of the endometrium, bases on the following advantages: high dose intensity at the surface (approx. 325 r/min); favorable range of the β radiation of a maximum of 11 mm in the tissue; practical possibility of application by means of an instrumentarium developed by Becker and Scheer. The authors describe in detail how to determine, by biological and photographic methods, the dose intensity on the surface of the pearls and in the tissue. The histological examination of the endometrium performed on operative preparations, presents a clear picture of the depth effect of the β radiation. (auth)

6588

LOCALIZATION AND FOCUSING OF THE 15-MEV BETATRON BEAM. J. Becker, K. Werner, and G. Weitzel. Strahlentherapie 97, 202-10(1955) June. (In German)

Using as an example the Siemens 15-Mev betatron, the authors present a survey on the localization and focusing technique in deep ultrahard roentgen-ray therapy. They discuss and describe the methods to be used in the localization of the focus, the set-up of the irradiation plan and the centering of the beam on the focus. Description of a new special localization device, to be used in transilluminations by roentgen rays as well as of a simple device for the control of the position of the patient during the irradiation. (auth)

6589

RADIATION BIOLOGY IN THE TREATMENT OF CANCER. Werner Lorenz. Strahlentherapie 97, 325-37(1955) July. (In German)

The author reports his experiments in mice vaccinated with Ehrlich ascites carcinoma and treated with cysteine. When irradiating these mice, he ascertained that no increase takes place of the electivity of the radiation in its action on the tumor. On the other hand, roentgen irradiation of the region of the thymus resulted in an increase of the damaging effect of the radiation on the carcinoma. The general disturbances of the cancer patient's system produced by the presence of the tumor and the effects of the irradiation, are forcing the physician to submit the patient to a more intensive general therapy which is to be continued even after termination of the irradiations. In this connection, special importance is attributed to the vegetative hormonal system and to the particular position of irradiated patients. (auth)

6590

A TECHNIQUE FOR THE SURFACE RADIOTHERAPY OF SMALL AND LARGE FOCI WITH Sr^{90}. J. Becker and K. E. Scheer. Strahlentherapie 97, 372-5(1955) July. (In German)

The authors describe an applicator to be used in the treatment, by beta rays, of larger and smaller foci. Four sources of radiation, each charged with 50 mc Sr^{90} are located inside of a thin-walled roller out of plexiglas. The applicator is rolled back and forth over the focus. The authors indicate the isodoses and make suggestions with respect to the calculation of the therapeutic dose. It is possible to easily remove the sources of radiation from the roller and to use them individually in the treatment of smaller foci. (auth)

6591

ABSORPTION AND TISSUE DISTRIBUTION FOLLOWING THE INTRAPERITONEAL APPLICATION OF RADIOGOLD BRINE. Friedrich Pfander and Hanno Poppe. Strahlentherapie 97, 389-94(1955) July. (In German)

The authors made animal experiments with respect to the intraperitoneal application of radiogold brines of varying size of particles. Attention is drawn to the strong undesired action of the radiation on the reticuloendothelial system, particularly of the liver and the excretory organs. (auth)

TRACER APPLICATIONS

6592 USNRDL-TR-52

Naval Radiological Defense Lab., San Francisco.

MECHANISM OF ERYTHROCYTE DESTRUCTION IN THE

BURNED RAT. A. K. Davis and E. L. Alpen. May 24, 1955. 20p. Project NM-006-015. (AFSWP-777)

The rate of disappearance of Fe^{59}-tagged erythrocytes made by burned and control rats was measured in both normal rats and rats with a 25% body area burn. The erythrocytes made by a burned rat have a mean survival time of 9 days when injected into burned rats. The same cells injected into normal rats have a mean survival time of 42 days. When erythrocytes made by a normal rat were injected into a burned rat the mean survival time was 18 days compared with 40 days when the same cells were injected into unburned controls. These data indicate an increased rate of red cell destruction in the burned rat. As the erythrocytes made by a burned rat do not display an abnormally short survival time in the normal rat and since an increased rate of destruction of erythrocytes is observed when cells from either normal or burned rats are injected into burned rats, it appears that the process of red cell destruction is an abnormality initiated by the burn. (auth)

6593

RADIOACTIVITY USED IN BIOLOGY. Jean Govaerts. Bol. Radiactividad (Madrid) 25, 104-46(1953). (In French)

Methods are given for the study of the urinary excretion of PO_4 and Ca ions by using radiophosphorus and radiocalcium either singly or together. Carbon 14 is also discussed in some detail, including methods of measurement of C^{14}, the use of C^{14} for the study of urinary excretion of glucose, and some of the dangers of using radioactive barium carbonate. (B.J.H.)

6594

SEARCHES FOR EXPLOITABLE BIOCHEMICAL DIFFERENCES BETWEEN NORMAL AND CANCER CELLS. I. NUCLEIC ACID PURINE METABOLISM IN ANIMAL NEOPLASMS. L. L. Bennett, Jr., Howard E. Skipper, C. Chester Stock, and C. P. Rhoads (Southern Research Inst., Birmingham, Ala. and Sloan-Kettering Inst. for Cancer Research, New York). Cancer Research 15, 485-91(1955) Aug.

The relative incorporation into polynucleotides of guanine-2-C^{14}, 2,6-diaminopurine-2-C^{14}, adenine-8-C^{14}, and formate-C^{14} by a wide variety of animal tumors and host intestine and liver has been determined at 6 hours following a single injection of the labeled compounds. Relative to the control tissues, all tumors incorporated guanine poorly. Most tumor tissues utilized 2,6-diaminopurine as a polynucleotide guanine source as well as or better than did intestine or liver. The specific activities of intestinal polynucleotides 6 hours after the administration of labeled formate and adenine was somewhat higher than those of most tumors. Utilization of formate by liver was much lower than that by intestine or that by any of the tumors studied. (auth)

CHEMISTRY

6595 NP-5025

Library of Congress. Technical Information Div., Washington, D. C.

REPORTS ON BORON COMPOUNDS. (ABSTRACT BULLETIN U6). July 29, 1955. 9p.

6596 NRL-4569

Naval Research Lab., Washington, D. C.

WETTING PROPERTIES OF ORGANIC LIQUIDS ON HIGH-ENERGY SURFACES. INTERIM REPORT. H. W. Fox, E. F. Hare, and W. A. Zisman. June 7, 1955. 25p. Project No. NR 602-100.

An investigation has been made of the relation between the constitution of organic liquids and their ability to wet and spread on solids having high melting points (high free surface energies). Wettability was measured by the contact angle at 20°C of each liquid on various metals, fused silica, and sapphire (α-alumina). The qualitative effects on the wettability of varying the temperature, humidity, and roughness of solid are discussed. Large differences were found in the wettability of the various metals and the silica and sapphire. These were caused by differences in the adsorption forces and by the existence of a firmly bound layer of water of hydration on the surfaces of the nonmetallic crystals. It was found that many carboxylic esters hydrolyze at ordinary temperatures upon being adsorbed on silica or sapphire. When the products released by such hydrolysis "in situ" formed adsorbed films having a low enough critical surface tension, the parent ester was nonspreading. It is concluded that the wettability of smooth high-energy surfaces by organic liquids can be predicted approximately from knowledge of the orientation and packing of the molecules adsorbed from the liquid phase. (auth)

6597 NYO-1040

Burns and Roe, Inc., New York.

TERMINATION REPORT RELATING TO THE SHEER-KORMAN PROCESS. Charles Sheer, Samuel Korman, Philip H. Sellew, and Willis R. Rice. July 1950. Changed from OFFICIAL USE ONLY Nov. 22, 1954. 127p. Contract AT(30-1)-438.

The Sheer-Korman process is a method for producing chlorides of metals by the use of a high-erosion arc in a chlorine atmosphere. A study was made of application of this method to the production of beryllium chloride. A development laboratory was constructed at the pilot plant site to determine factors required for the construction of a commercial plant. Successful experimental anodes were developed by an extrusion process from beryl ore and bituminous coal. Process demonstrations were made; a small pilot plant was designed, constructed, and operated; and research and development were conducted on a laboratory scale. Chloridization of beryl ore and bituminous coal anodes was demonstrated. Some progress was made in development of a collection system, including collection by cold electrostatic precipitation. Data obtained prior to termination of the contract were not sufficient to permit an economic evaluation of the process. (C.H.)

6598 ST-9-2900-1

Ordnance School, Aberdeen Proving Ground, Md.

FUNDAMENTALS OF EXPLOSIVES, U. S. AND FOREIGN. Jan. 1953. 57p.

A text is presented for use in courses on explosives conducted by The Ordnance School. It serves as a source of nontechnical information in the field of explosives covering the composition, behavior, application, and effects of various explosives in use by the armies of the U. S. and foreign nations. (J.E.D.)

6599 UCRL-4527

California. Univ., Livermore. Radiation Lab.

THE HEAT OF SOLUTION OF SODIUM BOROHYDRIDE AND THE ENTROPY OF BOROHYDRIDE ION. Stuart

R. Gunn and LeRoy G. Green. July 1955. 4p. Contract W-7405-eng-48.

Experimental methods for determining the heat of solution of $NaBH_4$ and the entropy of the BH_4 ion are described. Results give the heat of solution of $NaBH_4$ as -709 ± 5 cal/mole and entropy for the BH_4 ion as 26.3 e.u. (B.J.H.)

6600

THE KINETICS OF THE THERMAL DECOMPOSITION OF NITRIC ACID IN THE LIQUID PHASE. Glenn D. Robertson, Jr., David M. Mason, and William H. Corcoran (California Inst. of Tech., Pasadena). J. Phys. Chem. 59, 683-90 (1955) Aug.

The kinetics of the liquid phase decomposition of HNO_3 in the temperature range 54 to 88°C suggests that the unimolecular decomposition of N_2O_5 which is known to exist in fuming nitric acid solutions plays a significant role in the rate-determining step. A rate mechanism experimentally indistinguishable from that of the N_2O_5 hypothesis involves the product $(NO_2^+)-(NO_3^-)$. The effect of several inorganic additives, namely, H_2O, N_2O_4, N_2O_5, KNO_3, $KHSO_4$, $NOHSO_4$, H_2SO_4, and $HClO_4$, on the rate of decomposition was in agreement with these postulated rate mechanisms. The inhibition of the decomposition rate by various additives tested was found to be insufficient to prevent the eventual attainment of high equilibrium pressures resulting from the decomposition of fuming nitric acid when stored in closed containers for periods of about a month in the temperature range 54 to 88°C. Of all the additives tested on both a molal and a weight basis, H_2O gave the most pronounced inhibiting effect on HNO_3 decomposition. (auth)

6601

THE POLONIUM HALIDES. PART I. POLONIUM CHLORIDES. K. W. Bagnall, R. W. M. D'Eye, and J. H. Freeman (Atomic Energy Research Establishment, Harwell, Berks, England). J. Chem. Soc., 2320-6(1955) July.

Polonium dichloride and tetrachloride have been prepared on the milligram scale and some of their chemical properties have been investigated. A chloride ammine and ammonium and cesium hexachloropolonite have also been prepared. The dichloride is orthorhombic and ammonium hexachloropolonite is face-centered cubic. The deposition of milligram amounts of Po^{210} on to gold foil and wire is described. (auth)

6602

POLAROGRAPHIC TECHNIQUES. Louis Meites. New York, Interscience Publishers, Inc., 1955. 317p.

A comprehensive treatment of polarographic techniques is given. Included are a brief discussion of the nature and scope of polarographic measurements, and more detailed discussions of the polarographic limiting current and the theory of the current-voltage curve. The chemical and thermodynamic conclusions which may be drawn from data on the half-wave potential of a reversible wave are described. Techniques of quantitative polarograph analysis and other special techniques are given. Maxima and their suppression and amperometric titrations are also discussed. (B.J.H.)

6603

DETERMINATION OF THE NUMBER OF ELECTRONS PARTICIPATING IN THE ELECTROCHEMICAL REDUCTION OF NIOBIUM AND TITANIUM. E. I. Krylov and V. S. Kolevatova (Ural Polytechnic Inst.). Zhur. Fiz. Khim. 29, 818-21(1955) May. (In Russian)

ANALYTICAL PROCEDURES

6604 IDO-14329

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

MANUAL OF PREPARATION OF ANALYTICAL REAGENTS AT THE CHEMICAL PROCESSING PLANT. M. J. Shepherd, Jr., Gloria J. Harrison, and J. E. Rein, eds. July 15, 1955. 93p. Contract AT (10-1)-205.

The preparations of all reagents and standard solutions that are routinely used by the Analytical Section of the Chemical Processing Plant except those used by the Spectrochemical Group are described. The manual is divided into three sections: general reagents, standard solutions, and calibration standards. (auth)

6605 LA-1858

Los Alamos Scientific Lab., N. Mex.

ANALYTICAL PROCEDURES OF THE INDUSTRIAL HYGIENE GROUP. E. E. Campbell, B. C. Eutsler, Billye Head, Victoria E. Johnson, M. F. Milligan, W. D. Moss, M. C. Robbins, and C. P. Skillern—Jean McClelland, comp. Dec. 1954. 173p. Contract W-7405-eng-36.

Procedures are presented which have been used in a wide variety of analyses on samples of urine, air, water, blood, oil, and other materials. The currently accepted maximum allowable concentration of toxic materials is given, where such information is available. Procedures are included for determinations of acetone, Am, anthracene, arsine, As, Ba, Be, boric acid and boric acid salts, Cd, chlorinated hydrocarbons, cyanide, fluorides, Fe, Pb, Li, Hg, methanol, naphthalene, nitrogen oxides, oil mists, P, Pu, Po, sodium hydroxide, sulfate ratio, trinitratoluene, tritium, U, and Zn. (C.H.)

6606 PDB-153

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.

THE DETERMINATION OF TOTAL ACID, FORMALDEHYDE AND FORMIC ACID IN SOLUTIONS CONTAINING NITRIC ACID, URANIUM AND IRON. E. Mizzan. Nov. 22, 1954. 32p.

Procedures are presented for the determination of total acid, formaldehyde, and formic acid in solutions containing HNO_3 U and Fe. These solutions arise from the destruction of HNO_3 with formaldehyde. In the total acid determination, the U and Fe are complexed as the oxalates to prevent their hydrolysis during the titration of the acid with standard alkali. Formaldehyde is determined spectrophotometrically by using chromotropic acid in a concentrated H_2SO_4 medium to develop the color. Nitrate interferes with the color development when the NO_3^-/HCHO gram equivalent ratio is greater than 2. The formaldehyde is separated from the nitrate by distillation from the sample solution at pH 3.5. The formic acid determination is based upon its quantitative reduction of $HgCl_2$ to Hg_2Cl_2 on heating for 2 to 3 hours at 90°C and pH 4.5. The Hg_2Cl_2 formed is determined gravimetrically. An accuracy of ±3% is obtained by these determinations. Certain limitations have been placed on the amounts of U and Fe that may be present for satisfactory results. (auth)

DEUTERIUM AND DEUTERIUM COMPOUNDS

6607

HYDROGEN ISOTOPE EFFECT IN THE OXIDATION IN

VIVO OF METHIONINE LABELED IN THE METHYL GROUP. Julian R. Rachele, Edward J. Kuchinskas, F. Howard Kratzer, and Vincent du Vigneaud (Cornell Univ. Medical Coll., New York). J. Biol. Chem. 215, 593-601 (1955) Aug.

A hydrogen isotope effect has been demonstrated by a comparison in vivo of the oxidation of labeled methionine preparations in which C^{14} atoms in the methyl group are bonded either to protium atoms or to deuterium atoms. The methyl groups in which the C^{14} is bonded to deuterium were oxidized at a rate from 60 to 80% of the rate of oxidation of methyl groups containing the C^{14} bonded to protium. The need for appropriate double labeling of single carbon units for metabolic studies is emphasized. (auth)

FLUORINE AND FLUORINE COMPOUNDS

6608

THE KINETICS OF FLUORINATION OF NICKEL OXIDE BY CHLORINE TRIFLUORIDE. R. Lynn Farrar, Jr. and Hilton A. Smith (Carbide and Carbon Chemicals Co., Oak Ridge, Tenn.). J. Phys. Chem. 59, 763-8(1955) Aug.

A study of the kinetics of fluorination of nickel oxide powders to nickel fluoride with gaseous chlorine trifluoride has been made over the temperature range 25 to 180°C, and a mechanism has been proposed by which this conversion process takes place. Pressure variations of 0.3 to 1.0 atmosphere produced a slight effect on the kinetics of conversion which could be explained by the difference in surface concentration of reactant gas at the various pressures. The activity energy was determined to be 19.6 kcal/mole when corrected for decreasing surface concentration of reactant gas at elevated temperatures. The conversion proceeded by a linear rate which meant that the fluorinated material did not form a continuous coating over the unreacted material, in spite of the fact that the molar volume of the product is larger by a factor of two than that of the nickel oxide. (auth)

MOLECULAR STRUCTURE

6609 ISC-633

Ames Lab., Ames, Iowa.

A CORRELATION OF BOND LENGTH WITH STRETCHING FREQUENCY FOR CARBON–OXYGEN AND CARBON–NITROGEN SYSTEMS. E. Miller Layton, Jr., Robert D. Kross, and Velmer A. Fassel. Aug. 11, 1955. 19p. Contract W-7405-eng-82.

Graphical correlations of stretching frequencies with bond lengths for C–O and C–N systems in various compounds are presented. (auth)

6610

THE STRUCTURE OF ICE. R. E. Rundle (Ames Lab., Ames, Iowa). J. Phys. Chem. 59, 680-2(1955) Aug.

Problems connected with the structure of ice are reviewed, particularly the problem connected with residual entropy and polar vs. non-polar structures. It is shown that if, at low temperature, ice is truly hexagonal, then there is a good reason to believe it is polar. A polar structure is attractive in explaining some of the physical properties of ice, but it leaves the residual entropy problem unsolved while the non-polar structure leaves some physical properties unexplained, but accounts for the entropy. (auth)

RADIATION CHEMISTRY

6611

PHOTOCHEMICAL PRODUCTION OF HYDROGEN PEROXIDE CATALYZED BY MERCURIC SULFIDE. L. I. Grossweiner (Argonne National Lab., Lemont, Ill.). J. Phys. Chem. 59, 742-6(1955) Aug.

Visible light irradiation of suspended red mercuric sulfide in distilled water containing oxygen induces hydrogen peroxide formation, with no apparent change occurring to the mercuric sulfide. The data obey the following rate equation: $pt = (X_0 - X) + 2X_f \log_e[(1-X_0/X_f)/(1-X/X_f)]$, where X_0 and X are the initial and instantaneous H_2O_2 concentrations in solution, respectively, X_f is proportional to the HgS surface, p is proportional to the light intensity and t is the irradiation time. The proposed primary products are HO_2 and OH. It is suggested that the HO_2 is formed via the capture of conduction electrons from excited HgS by adsorbed H^+, in the presence of dissolved oxygen, and that the OH is formed by anodic discharge of adsorbed OH^-. The proposed rate-controlling processes are the desorption of HO_2 and the decomposition of H_2O_2 by HO_2 on the surface. It is consistent with the experimental results to assume that the OH recombines to water and oxygen. (auth)

RADIATION EFFECTS

6612

THE SINGLE AND COMBINED EFFECT OF NITROGEN MUSTARD GAS AND X RADIATION ON AQUEOUS PROTEIN SOLUTIONS. H. Koch, H. W. Vasterling, and C. R. Wilk. Strahlentherapie 97, 211-17(1955) June. (In German)

By means of electrophoretic investigations the author ascertained that the effect produced by nitrogen mustard on watery solutions of human protein is in conformity with that produced by roentgen rays. When treating the protein solutions with a dose of nitrogen mustard below the threshold, then the effect of the roentgen rays is increased. The increase in the effect of the radiation is interpreted as being due to the mechanism of action of nitrogen mustard and of roentgen rays acting in a different way on the protein molecule. (auth)

6613

ATOMIC RADIATION TREATMENT OF POLYMERS. A. Charlesby (Tube Investments Research Labs., Cambridge, England). Research 8, 288-94(1955) Aug.

Long chain polymers, when exposed to intense doses ($\sim 10^8$ r) of radiation, may be affected in the following ways: cross linking of the molecules to form structures of infinite molecular weight; or fracture of the main chain resulting in a decrease of molecular weight and degradation from a solid to a liquid. Benzene may act as an inhibitor to radiation damage in the polymers. (C.W.H.)

6614

THE CHEMICAL EFFECTS OF IONISING RADIATION IN SOLIDS. II. H. G. Heal (Queen's Univ., Belfast). Atomics 6, 241-7(1955) Aug.

A survey of published work on the chemical effects of ionizing radiation in solids is given. (B.J.H.)

RARE EARTHS AND RARE-EARTH COMPOUNDS

6615

LANTHANON SULPHITES AND THEIR SEPARATION BY

SELECTIVE OXIDATION. R. C. Vickery (Commonwealth Fertilisers and Chemicals Ltd., Yarraville, Victoria, Australia). J. Chem. Soc., 2360-7(1955) July.

The preparation and properties of simple and complex rare earth sulfites are described. Oxidation of double sulfites to double sulfates has been employed as a means of separating the light from the heavy rare earths. (auth)

6616

THE MECHANISM OF A CHROMATE PROCESS FOR THE SEPARATION OF THE LANTHANONS AND YTTRIUM. R. W. Hall (Thorium Ltd., Ilford, Essex, England). J. Chem. Soc., 2409-12(1955) July.

From a mixture containing middle and heavy rare earths, yttrium can be concentrated by a chromate process which combines both solubility and basicity separations in one operation; by the addition of a base to a rare-earth dichromate solution, the strongly basic lighter rare earths are precipitated as double or normal chromates, while the weakly basic heavier rare earths are removed by hydrolysis as basic salts. (auth)

6617

ON THE SEPARATION OF THE RARE EARTHS BY ETHYLENEDIAMINETETRAACETIC ACID. II. SOME PROPERTIES OF THE COMPLEX Na[RY]. G. Brunisholz, E. Vescovi, and M. Loretan. Helv. Chim. Acta 38, 1186-90 (1955) Aug. (In French)

Four hydrates of sodium lanthanum ethylenediamine tetraacetate (Na[LaY]· x H_2O) have been isolated. Na[LaY]·$3H_2O$ crystallizes at 50°, Na[LaY]·$8H_2O$ at 35°, and Na[LaY]·$9H_2O$ at 25°C. A hexahydrate, Na[LaY]·$6H_2O$ has also been obtained, but the conditions for its formation are not well established. Other rare earths (R) appear so far to crystallize only as octahydrates, Na[RY]·$8H_2O$; they are isomorphous with Na[LaY]·$8H_2O$. The octahydrates are orthorhombic pyramidal and therefore piezoelectric. On heating, all the hydrates easily lose water; the anhydrous compounds are stable up to 350°C. With the exception of the La salt, the solubility data are in good agreement with published values. (auth)

6618

OXIDATION STATES OF EUROPIUM IN THE ALKALINE EARTH OXIDE AND SULFIDE PHOSPHORS. P. M. Jaffe and E. Banks (Polytechnic Inst. of Brooklyn). J. Electrochem. Soc. 102, 518-23(1955) Sept.

Europium is divalent in the sulfides and trivalent in the oxides when they are prepared in inert atmospheres. Use of a reducing atmosphere in preparing oxide phosphors also gives divalent Eu, at least for CaO, SrO, and possibly BaO. As in the sulfides, the peak emission of the reduced oxides is dependent on the matrix, while the lines of the normal oxides show less dependence on the nature of the host crystal. (auth)

SEPARATION PROCEDURES

6619 ACCO-64

American Cyanamid Co. Atomic Energy Div. Raw Materials Development Lab., Winchester, Mass.

PROCESS DEVELOPMENT STUDIES FOR LUKACHUKAI ORES. Daniel C. McLean. Apr. 18, 1955. 63p. Contract AT(49-1)-533.

A summary of process development studies conducted with Lukachukai ores is presented. Toasting and leaching of uranium leach residues, uranium recovery by ion exchange, and the recovery of vanadium from leach liquors are discussed. (For preceding report see ACCO-19.) (J.E.D.)

6620 NBL-108

New Brunswick Lab., AEC, N. J.

SEPARATION OF RARE EARTHS FROM THORIUM NITRATE. M. W Lerner and G. J. Petretic. Aug. 1955. 19p.

Rare earths may be separated from Th by a procedure based upon a pentaether-diethyl ether extraction of an 8M HNO_3 solution of Th followed by an oxine–chloroform extraction. The rare earths may be collected by precipitation of the oxinates with La as a carrier. The procedure takes about four hr. (C.W.H.)

6621

AN IMPROVED METHOD FOR OPERATING ION-EXCHANGE RESIN COLUMNS IN SEPARATING THE RARE-EARTH ELEMENTS. Walter E. Nervik (Radiation Lab., Univ. of California, Livermore). J. Phys. Chem. 59, 690-5(1955) Aug.

A gradient elution method has been adapted for operating an ion-exchange resin column using an eluting agent in which the pH is changed continuously. The method shortens the column operating time required for separation of the rare earth elements without adversely affecting their purity. (auth)

6622

THE SOLVENT EXTRACTION BEHAVIOR OF INORGANIC COMPOUNDS: MOLYBDENUM(VI). I. Nelidow and R. M. Diamond (Harvard Univ., Cambridge, Mass.). J. Phys. Chem. 59, 710-18(1955) Aug.

The distribution ratios of molybdenum(VI) between various organic solvents and certain aqueous acids were determined as a function of the acid concentration, the temperature, and, in a few cases, the variation of the molybdenum concentration from 10^{-4} to 10^{-2}M. The results lead to the determination of better conditions for the extraction of molybdenum(VI) than the customary method from 6M HCl using diethyl ether. A discussion of the nature of the extracting species is given, and it is suggested that there are four main factors involved in the mechanism of metal extraction systems such as this one and, for example, the iron(III)-hydrochloric acid–ether system. These factors are: association and polymerization; acid strength of species; complex formation with halide ion, etc.; and solvation of species in the two phases. (auth)

6623

ION-EXCHANGE EQUILIBRIA INVOLVING RUBIDIUM, CESIUM AND THALLOUS IONS. O. D. Bonner (Univ. of South Carolina, Columbia). J. Phys. Chem. 59, 719-21 (1955) Aug.

Equilibrium studies involving rubidium, cesium, and thallous ion on Dowex 50 resins of approximately 4, 8, and 16% divinylbenzene content have been made while maintaining a constant ionic strength of approximately 0.1M. The characteristic maximum water uptake of the resin in these ionic forms has been measured. (auth)

SPECTROSCOPY

6624 ISC-620

Ames Lab., Ames, Iowa.

THE INFRARED SPECTRA OF AROMATIC COMPOUNDS.

III. THE 1045-1185 cm^{-1} VIBRATION IN MONOSUBSTITUTED BENZENES. Robert D. Kross and Velmer A. Fassel. July 7, 1955. 9p. Contract W-7405-eng-82.

In monosubstituted benzenes of the type $(phenyl)_nM$, where n is the valence of the substituent element M, the frequency of the 1045-1185 cm^{-1} vibration is directly related to the partial ionic character of the C_{ar}-M bond. Using the square of the electronegativity of the substituent as a measure of the bond polarity, a plot is presented which related this parameter to the corresponding frequency. From the four straight-line curves obtained for group IVB, VB, VIB and VIIB elements, an expression is derived equating electronegativity with the observed frequency. Electronegativity values calculated from this equation compare favorably with accepted values. (auth)

6625 ISC-621

Ames Lab., Ames, Iowa.

AN INFRARED STUDY OF PICRIC ACID MOLECULAR COMPLEXES. Robert D. Kross and Velmer A. Fassel. July 13, 1955. 18p. Contract W-7405-eng-82.

The infrared spectra of 42 picric acid molecular complexes show that the nitro asymmetric stretching and the out-of-plane C-H bending vibrations of the picric acid component are sensitive to complex formation. The frequencies of these vibrations can be correlated with the type of complex formed, i.e, $\pi-\pi$ or $n-\pi$ type charge transfer. Many of the $\pi-\pi$ complexes were found to contain localized intermolecular interactions which give rise to an additional asymmetric stretching vibration. The frequency of the C-H out-of-plane bending vibration of complexed picric acid is an indication of the type of complex formed. (auth)

6626 ISC-625

Ames Lab., Ames, Iowa.

THE INFRARED SPECTRA OF AROMATIC COMPOUNDS II. EVIDENCE CONCERNING THE INTERACTION OF π-ELECTRONS AND σ-BOND ORBITALS IN C-H OUT-OF-PLANE BENDING VIBRATIONS. R. D. Kross, V. A. Fassel, and M. Margoshes. July 21, 1955. 18p. Contract W-7405-eng-82.

In certain mono- and para-disubstituted benzenes the frequency of one of the C-H out-of-plane bending vibrations falls outside of the characteristic frequency range usually assigned to that vibration. The phenomenon is ascribed to bond rehybridization accompanying the out-of-plane vibrations, whereby the C-H σ-bonds of the benzene nucleus overlap with the π electrons of the molecules and tend to form sp^3 hybrids. The rehybridization results in decreased effective force constants for the vibrations. The extent of rehybridization depends on the concentration of the π electrons around the benzene ring, which in turn is dependent on the nature of the substituent. Other anomalous spectra are adequately explained on the same basis. (auth)

6627

INVESTIGATION OF HYPERFINE STRUCTURE IN THE SPECTRA OF PLUTONIUM AND ISOTOPES OF URANIUM. N. I. Kaliteevskii and M. P. Chaika (Leningrad State Univ.). Doklady Akad. Nauk S.S.S.R. 103, 49-51(1955) July 1. (In Russian)

SYNTHESES

6628 NBS-4031

National Bureau of Standards, Washington, D. C.

SYNTHESIS OF MALTOSE-1-C^{14}, MALTOBIONO-Δ-LACTONE-1-C^{14}, AND LITHIUM MALTOBIONATE-1-C^{14} FROM 3-(α-D-GLUCOPYRANOSYL) D-ARABINOSE. H. S. Isbell and R. Schaffer. Apr. 15, 1955. 19p.

A method is presented for the production of maltose-1-C^{14} from sodium cyanide-C^{14} and 3-(α-D-glucopyranosyl)-D-arabinose in 42% yield. The process includes the intermediate production of lithium maltobionate-1-C^{14} trihydrate and maltobiono-δ-lactone-1-C^{14}. Lithium maltobionate trihydrate is the first metallic salt of maltobionic acid to be crystallized. It was prepared not only by the cyanohydrin synthesis but also by the electrolytic oxidation of maltose in the presence of lithium bromide and lithium bicarbonate. Crystalline maltobiono-δ-lactone is likewise a new substance. It is difficultly soluble in alcohol mixtures. Concentration of Methyl Cellosolve solutions of maltobionic acid in the presence of seed crystals leads to a slow conversion of the acid to crystalline lactone. (auth)

6629 UCLA-339

California. Univ., Los Angeles. Atomic Energy Project. THE METABOLISM OF THE ESSENTIAL FATTY ACIDS. IV. INCORPORATION OF LINOLEATE INTO ARACHIDONIC ACID. Gunther Steinberg, William H. Slaton, Jr., David R. Howton, and James F. Mead. July 11, 1955. 20p. Contract AT-04-1-GEN-12.

Arachidonic acid from rats fed with methyl linoleate-1-C^{14} was isolated as its polybromide, reduced to arachidic acid, and degraded by the non-oxidative method of Dauben, Hoerger and Peterson. The distribution of the label shows that arachidonate is synthesized in the rat by the condensation of linoleate with acetate. (auth)

6630

SYNTHESIS OF METHYLCYCLOHEXANE LABELED WITH C^{14} IN THE METHYL GROUP. M. M. Sakharov and E. A. Andreev (Inst. of Physical Chemistry). Doklady Akad. Nauk S.S.S.R. 103, 87-9(1955) July 1. (In Russian)

TRACER APPLICATIONS

6631

ISOTOPIC EXCHANGE OF MANGANESE DURING THE REACTION BETWEEN MANGANESE(II) AND PERMANGANATE. James A. Happe and Don S. Martin, Jr. (Ames Lab., Ames, Iowa). J. Am. Chem. Soc. 77, 4212-17(1955) Aug. 20.

Isotopic exchange experiments with Mn^{54} have been performed which involved various chemical forms of manganese existing during the reaction of Mn^{++} with MnO_4^- in acid solutions to give a hydrous oxide containing manganese(IV). A rapid 30 to 40% exchange occurred between Mn^{++} and a freshly formed precipitate. However, 60 to 70% of the precipitate was unavailable for rapid exchange within 1 to 2 minutes of formation. Isotopic equilibrium during the over-all reaction between Mn^{++} (labeled) and MnO_4^- required that MnO_4^- be completely reduced to Mn(IV) before the formation or growth of precipitate grains. Tetraphenylarsonium permanganate was precipitated from solutions of MnO_4^- and Mn^{++} (labeled) in 1 to 2 molar HNO_3 before the onset of the precipitation of MnO_2 which occurred at ca. 10 hours. The permanganate fraction had gained enough activity to correspond to an exchange half-time of 10 to 15 hours. Spectrophotometric studies showed that before a precipitate appeared at least 40% of the MnO_4^- was reduced by a reaction approximately first order in MnO_4^- and without an

induction period. In the presence of such large amounts of intermediate species, the exchange between MnO_4^- and Mn^{++} may not be real. (auth)

6632

A CARBON-14 ISOTOPE EFFECT STUDY OF THE DIECKMANN CONDENSATION OF DIETHYL PHENYLENEDIACETATE. Wayne L. Carrick and Arthur Fry (Univ. of Arkansas, Fayetteville). J. Am. Chem. Soc. 77, 4381-7 (1955) Aug. 20.

The principle of locating the rate-determining step in a reaction by successively labeling different positions in a molecule and determining whether or not there is an isotope effect in the reaction has been applied to the Dieckmann condensation of diethyl phenylenediacetate. An intramolecular isotope effect of 5.6% is observed with diethyl phenylenediacetate-1-C^{14} and an intermolecular isotope effect of about 8.5% is observed with both diethyl phenylenediacetate-1-C^{14} and diethyl phenylenediacetate-2-C^{14} when the reaction is carried out in alcohol solution using sodium ethoxide as the condensing agent. The only step in the Dieckmann condensation which involves both labeled positions is carbon–carbon bond formation, so it is concluded that this is the rate-determining step of the reaction. The theoretical implications of this interpretation are discussed briefly. When the reaction with diethyl phenylenediacetate-1-C^{14} is carried out in toluene solution using metallic sodium as the condensing agent an intramolecular isotope effect of 1.6% is observed. The low value in this case probably is due to product selection in an irreversible step not involving the isotopic center prior to the rate-determining step. (auth)

URANIUM AND URANIUM COMPOUNDS

6633 ANL-FGF-4

Argonne National Lab., Lemont, Ill.

THE MELTING OF HIGH PURITY URANIUM. B[ernhard] Blumenthal. Nov. 14, 1952. Decl. Jan. 4, 1955. 30p. Contract W-31-109-Eng-38.

A melting process was developed by which high-purity electrolytic uranium crystals can be converted into sound ingots without serious contamination. Careful preparation of the crystals, melting in a high vacuum, and directional solidification led to a metal of better than 99.993 wt.% purity. (auth)

6634 K-1239

Carbide and Carbon Chemicals Co. K-25 Plant, Oak Ridge, Tenn.

PRODUCTION OF UO_3 BY DRYING–CALCINING. T. Shapiro and R. J. Clouse. Aug. 26, 1955. 12p. Contract W-7405-eng-26.

The combination of drum drying and calcining has been shown to be adaptable to the production of UO_3 or U_3O_8 from uranyl nitrate solutions. Tests have been run on commercially available drum dryers and rotary calciners, indicating that small experimental-size units have sufficient capacity to produce 15 kg of uranium per eight-hour day. Although the initial cost of the dryer-calciner system is only slightly more favorable than the precipitation filtration method, operating costs are definitely lower in the dryer-calciner process. Necessity for chemical processing techniques which are simple, efficient, and which are not demanding of continuous operator attention were recognized by both the design and operating departments. The investigation of a more desirable method was initiated in order to eliminate the costly method of precipitating, filtering, and ignition of recovered uranium solutions. (auth)

6635

INVESTIGATION OF COMPLEX COMPOUNDS OF URANYL ION HAVING SIGNIFICANCE FOR ANALYTICAL CHEMISTRY. I. N. P. Komar and Z. A. Tret'yak (Kharkov State Univ.). Zhur. Anal. Khim. 10, 236-43(1955) July–Aug. (In Russian)

Experimentally determined data on hydrolysis of UO_2^{++}, dissociation of UO_2OH^+, and effect of Cl^- and NO_3^- ions on these processes are presented. (G.Y.)

WASTE DISPOSAL

6636 BNL-2409

Brookhaven National Lab., Upton, N. Y.

RADIOACTIVE LIQUID WASTE CONTROL. John M. Ruddy. July 12, 1955. 17p.

The liquid radioactive waste disposal systems for tracer-level, warm, and hot chemical laboratories are outlined. The designs of neutralizing tanks and proportional samplers are discussed. Sampling techniques are reviewed. (C.W.H.)

ENGINEERING

6637 AWRE-O-74/54

Gt. Brit. Atomic Weapons Research Establishment, Aldermaston, Berks, England.

A LABORATORY SCALE TUMBLER-TYPE WASHING MACHINE. D. G. Stevenson. Mar. 9, 1955. 13p.

HEAT TRANSFER AND FLUID FLOW

6638 NAA-AL-1914

North American Aviation, Inc., Downey, Calif.

THE TURBULENT BOUNDARY LAYER WITH VARIABLE PRANDTL NUMBER. E. R. Van Driest. Apr. 2, 1954. 38p. (AD-49814)

The general theory for the solution of the energy equation for laminar boundary layers with variable Prandtl number is applied directly to the turbulent case in order to extend the von Karman analogy between heat transfer and fluid friction to include a turbulence Prandtl number other than unity, and a realistic shear distribution other than constant across the turbulent portion of the boundary layer. The calculation of heat-transfer coefficients for high and low speeds is discussed, including application to liquid metals. The general heat-transfer theory is compared with data for the supersonic flow of air over a flat plate in a wind tunnel. (auth)

MATERIALS TESTING

6639 AD-38811

United States Testing Co., Inc. Boston Research Div., Boston.

RESEARCH STUDIES OF PLASTIC COMPOUNDS FOR

CASTING, ENCAPSULATING AND POTTING. Quarterly Progress Report No. 8 for the period March 15, 1954 through June 14, 1954. Alfred K. MacKenzie and Elizabeth C. Dearborn. July 15, 1954. 40p. DA Project 3-93-00-503. Contract DA-36-039-sc-42459.

The properties of maleic anhydride- and phthalic anhydride-cured polyglycidyl ether resins have been studied as to possible potting, casting, and laminating applications. Several intermediate polyphenylol compounds and their glycidyl ethers were prepared. (C.W.H.)

6640 AD-44804

United States Testing Co., Inc. Boston Research Div., Boston.

RESEARCH STUDIES OF PLASTIC COMPOUNDS FOR CASTING, ENCAPSULATING AND POTTING. Final Report for the Period June 15, 1952 through September 14, 1954. Elizabeth C. Dearborn. Oct. 15, 1954. 44p. DA Project No. 3-93-00-503. Contract DA36-039-sc-42459.

Several epoxy resins were prepared and evaluated as possible materials which could be used for casting, encapsulating, or potting electrical and electronic equipment. Resins with increased resistance to deformation at elevated temperatures were obtained by increasing the number of reactive positions either in the glycidyl ether or in the curing agent and by introducing polar substituents into either the ether or the curing agent. Acid anhydride-cured epoxy resins are superior to amine-cured ones with respect to electrical properties, heat stability, and solvent and chemical resistance. The maleic anhydride-cured ether appears to offer the most promise as a high temperature resin. (C.W.H.)

6641 DEV-902

Douglas Aircraft Co., Inc., Santa Monica, Calif.

FATIGUE STRENGTH OF HYDRAULIC TUBING. C. S. Yen and J. L. Waisman. Mar. 13, 1953. 127p. Contract AF 33(038)-19940. (AD-61261)

Hydraulic pulsing fatigue test equipment was developed, and tests were conducted to compare the fatigue life of two materials commonly used in high-pressure hydraulic systems, to compare the life of formed and straight shapes, and to determine the effects of different dimensions and manufacturing variables on fatigue life. For a given horsepower transmission and a given fatigue life, stainless steel "special temper" tubing (AMS 5566) is lighter than 61ST6 aluminum alloy tubing (AMS 4083). Formed portions of lines have lower fatigue life than straight portions due to the flattening of the cross section normally accompanying the forming operation. Varying the diameter and the wall thickness within the limits explored does not seem to significantly affect the fatigue life for a given stress level. Variations in the manufacturing technique affect fatigue life primarily by their effect on the smoothness of the surface. A method of predicting the life of tubing in service is submitted with accompanying data. The standard "thick-wall" formula for O.D. stress in tubing was found to give accurate values in the elastic region for four sizes of tubing tested under hydrostatic pressure. The hydrostatic yield and burst pressures can be fairly accurately calculated when the correction factors listed in this report are applied to the standard "thick-wall" formula for I.D. stress. (auth)

6642

A NEW MATERIAL: IRRADIATED POLYETHYLENE. F. J. Bockhoff (Fenn Coll., Cleveland) and J. A. Neumann (American Agile Corp., Maple Heights, Ohio). Chem. Eng. 62, No. 9, 228, 30, 32, 34(1955) Sept.

Irradiated polyethylene can be produced by the bombardment of conventional polyethylene with extremely high-energy electrons. This treatment results in a transformation of properties in that polyethylene is changed from an easily fusible thermoplastic to a thermoset material which retains form stability at temperatures as high as 400°F. A definite increase in certain mechanical properties is also noted and these improvements are retained at elevated temperatures. Solvent resistance is increased, and the phenomenon of stress cracking is completely eliminated. Yet, within proper dose limits, irradiated polyethylene retains all of the traditionally desirable properties of conventional polyethylene: toughness, flexibility, impact resistance, and complete inertness in most chemical environments. (auth)

PUMPS

6643 KAPL-1367

Knolls Atomic Power Lab., Schenectady, N. Y.

THEORY AND ENGINEERING APPLICATION OF A PRACTICAL THERMOELECTRIC ELECTROMAGNETIC (TEM) PUMP. Lewi Tonks. Aug. 1, 1955. 28p. Contract W-31-109-Eng-52.

Calculations show that thermoelectricity can have a practical power application to the electromagnetic pumping of liquid metal coolant through a nuclear reactor and its associated primary heat exchanger with the thermoelectric elements and circuit as an integral part of the exchanger. Here the basic theory of such a device is developed, including the parasitic circulation of current within each fluid metal channel, the varying temperature difference over the length of the exchanger, and the modification of theory consequent to having the fluid metal in pipes. Possible causes of instability are discussed and how to attack their analysis is indicated, but no analysis is made. The theory is applied to a specific engineering design. (auth)

TRACER APPLICATIONS

6644

USE OF RADIOPHOSPHORUS P^{32} FOR THE STUDY OF THE DISPERSION OF SALINE SOLUTIONS IN THE SOIL. J. Govaerts, A. Lecrenier, C. Corin, E. Dermine, O. Liard, and J. Trezinski. Bol. Radiactividad (Madrid) 26, 45-70 (1954). (In French)

A detailed discussion is given on the study of the dispersion of saline solutions in soil by using P^{32} as a tracer. Resulting data are given both in tabular and graphical form. (B.J.H.)

MINERALOGY, METALLURGY, AND CERAMICS

CERAMICS AND REFRACTORIES

6645 AD-52428

Bettinger Corp., Waltham, Mass.

INVESTIGATION DIRECTED TOWARD THE DEVELOP-

MENT OF CERAMIC COATINGS WITH HIGH REFLECTIVITIES AND EMISSIVITIES FOR USE IN THE AIRCRAFT POWER PLANTS. Quarterly Report No. 3. James C. Hale and Edward A. Douglas. Jan. 15, 1955. 38p. Contract AF 33(616)-2376.

Tests were made on the oxidation resistance of various metals, and the effects of oxide diffusion through emissive coatings were considered. Tests were also made to check possible emissivity changes which might occur between a durable enamel and one which had been oxided. The emissivity data on emissive coatings are discussed. The method of recalibrating the emissivity machine was also given in detail. Data are given on the development of oxidation resistant coatings. Reflective oxide emissivities and the effect of glass on emissivity of pure oxides are also studied. (B.J.H.)

6646 AECU-3063

California. Univ., Berkeley. Minerals Research Lab.
FUNDAMENTALS OF GLASS-TO-METAL BONDING. PART A. TEMPERATURE AND PRESSURE DEPENDENCE OF THE WETTABILITY OF METALS BY GLASS. Richard M. Fulrath, Stephan P. Mitoff, and Joseph A. Pask. PART B. REACTIONS OF TANTALUM AND SODIUM SILICATE GLASS. Stephan P. Mitoff. Fifth Technical Report. June 24, 1955. 31p. Project No. 7. Contract AT-(11-1)-34.

A vacuum furnace system for studying the effects of temperature and pressure on the wettability of metals by glass was constructed; this system was capable of subjecting test combinations up to temperatures of 1400°C at a working pressure of 1×10^{-5} mm of Hg. The mechanism of wetting with change in pressure and temperature is discussed primarily on the experimental data for the systems gold–sodium silicate glass and platinum–sodium silicate glass. Other metal–sodium silicate glass systems are discussed on this basis. The limitations imposed on the use of Young's equation for analyzing wettability in systems in which an interfacial compound is formed are discussed. A compound, identified by x-ray analysis as sodium metatantalate ($Na_2Ta_2O_6$) was found at the interface between a sodium silicate glass and tantalum metal which had been heated in vacuum to 1000°C. The compound was synthesized by other methods, and its structure investigated. (For preceding period see AECU-2925.) (auth)

6647 BMI-1020

Battelle Memorial Inst., Columbus, Ohio.
PREPARATION OF DENSE BERYLLIUM OXIDE. Collin Hyde, John F. Quirk, and Winston H. Duckworth. July 21, 1955. 25p. Contract W-7405-eng-92.

Ceramics of near-theoretical density were made by sintering powder compacts of high-purity, active BeO at 2500 to 3200°F in hydrogen. Compacts sintered at 2300°F, although less dense than those sintered at higher temperatures (2.86 as compared to 3.00 or 3.01 g/cm^3), had an average bend strength (27,900 psi) somewhat higher than any values previously reported for pure BeO ceramics. Fracture strengths of the densely sintered compacts approximated being inversely proportional to the average diameter of BeO crystals in the structure. This is not in accord with predictions based on Griffith's theory of fracture, which indicate that fracture strength is inversely proportional to the square root of average grain diameter. Increased crystal size in the sintered BeO compacts resulted from raising the sintering temperature. Attainment of dense high-strength compacts at low sintering temperatures is attributed to the use of specially prepared active BeO powders. The most active powders obtained resulted from calcining $Be(OH)_2$ at 1830°F. Attempts to characterize the active powders indicated that the beryllium starting compound, its method of preparation, and the heat treatment for decomposition to oxide, all had significant effects on sinterability. A marked decrease in sinterability occurred when the treatment of the powder produced microscopically identifiable BeO crystals. Isostatic pressing in deaired molds was superior to rigid-mold compaction for fabricating sound specimens from the very fine-grained active powder. Fabrication difficulties were somewhat accentuated by the air entrainment and high sintering shrinkage of the active-powder compacts. Increased forming pressures reduced the sintering shrinkage, but did not affect appreciably the final bulk density of compacts sintered at a given temperature. (auth)

CORROSION

6648 AERE-Lib/Trans-524

APPLICATIONS OF ELECTROCHEMISTRY TO INVESTIGATIONS IN CORROSION. Marcel Pourbaix. Translated by F. Hudswell from Werkstoffe u. Korrosion 5, 433-40(1954). 13p.

Some of the applications of electrochemistry to investigations in corrosion are discussed. In particular, the behavior of iron and carbon steels in the presence of bicarbonate solutions, the effect of chlorides on the behavior of normal and stainless steel, the general procedure for determination of the presence or absence of corrosion, and a process for combating boiler scale formation are discussed. (B.J.H.)

6649

FURNACE TESTS METALS VS. CORROSIVES. Paul C. Ziemke. Chem. Eng. 62, No. 9, 212-14(1955) Sept.

An oscillating furnace has been developed to study the effects of alternate heat and cold on metals in contact under turbulent conditions, for a wide variety of corrosive materials. It is possible to simulate turbulent flow conditions with this apparatus without the use of pumps. (C.W.H.)

GEOLOGY AND MINERALOGY

6650 GPR-2/55

Canada. Dept. of Mines and Technical Surveys. Mines Branch.
RADIOACTIVITY DIVISION GENERAL PROGRESS REPORT [FOR] APRIL–JUNE 1955. July 19, 1955. 24p.

A review of the work on ore dressing and extractive metallurgy, analytical methods and equipment, and investigations of ores from private companies and individuals is presented. No technical data are reported. (For preceding period see GPR-1/55.) (J.E.D.)

6651 RME-72

Grand Junction Operations Office, AEC, Colo.
SUMMARY OF AIRBORNE RADIOMETRIC SURVEYING IN THE CIRCLE CLIFFS UPWARP, GARFIELD COUNTY, UTAH. G. E. Klosterman. May 5, 1954. 13p.

Investigation of anomalous radioactivity located by the airborne radiometric survey in the Circle Cliffs area indicates that ore deposition is mainly controlled by

channels and scours. Uranium mineralization at most outcrops investigated is thin and of low grade. Faulting and jointing in the Circle Cliffs upwarp have no apparent effect on mineralization. Future potential of the Circle Cliffs area appears limited. Low grade material, if accepted in the future, will greatly increase the importance of the area. (auth)

6652 RME-2018

Division of Raw Materials. Salt Lake Exploration Branch, AEC.

EXAMINATION OF COPPER–URANIUM OCCURRENCES IN THE WILLAHA AREA, COCONINO COUNTY, ARIZONA. Harry E. Puttuck. Sept. 1954. 13p.

A study, consisting of field and laboratory work, was undertaken in an endeavor to establish possible structural mineralization controls associated with the copper–uranium occurrences in the Willaha area, Coconino County, Arizona. Uranium mineralization, apparent at present, is localized along small fissures and vugs and in certain beds and lenses of the middle member of the Kaibab formation (Permian). It is associated with copper and iron oxide staining. Though no definite ore controls were disclosed by this study, at least a limited program of shallow drilling is warranted on the property. This sub-surface exploration should determine possible extensions of known mineralized areas, explore surface radiometric anomalies, and provide data for the determination of possible guides to ore. Deeper exploration may encounter mineralization in other horizons of the Kaibab limestone. (auth)

6653 TEI-466

Geological Survey.

RADIOACTIVITY OF SOME COALS AND SHALES IN SOUTHERN ILLINOIS. E. D. Patterson. Aug. 1954. 23p.

Channel samples of the commercially important coal beds in the Caseyville, Tradewater, Carbondale, and McLeansboro formations of Pennsylvanian age, and samples of the black, hard, sheety, roof shales of several coal beds were collected in southern and central Illinois. The content of the coal is generally less than 0.001% uranium, but at one locality a one foot thick layer of Herrin No. 6 coal contains 0.008% uranium, and the ash of the coal contains 0.125% uranium. The radioactivity of some black shale beds overlying coals ranges from 0.003 to 0.018% equivalent uranium. The most widespread uranium-bearing rock found by this reconnaissance is the hard, black, sheety shale above the No. 5 coal in Saline, Gallatin, and Williamson Counties. Based on available sample data, the more radioactive parts of this shale range from one to three feet in thickness. (auth)

6654

CERIANITE CeO_2: A NEW RARE-EARTH OXIDE MINERAL. A. R. Graham (Dominion Gulf Co., Toronto, Ontario, Canada). Am. Mineralogist 40, 560-4(1955) July-Aug.

The discovery of a cubic (Fm3m) mineral with cell-edge 5.42 ± 0.01 A and composition $(Ce,Th)O_2$ with Ce:Th about 16:1 indicates a three-way isomorphous series among cerium, thorium and uranium dioxide minerals. (auth)

6655

URANINITE AND THORIANITE FROM ONTARIO AND QUEBEC. S. C. Robinson and A. P. Sabina (Geological Survey of Canada, Ottawa). Am. Mineralogist 40, 624-33 (1955) July-Aug.

The occurrence and mineral associations of 20 specimens of uraninite and thorianite are described. All the deposits occur in the Grenville Sub-province of the Canadian Shield. The range in composition of these 20 specimens as determined by x-ray spectrography is U_3O_8 25 to 73%, ThO_2 7 to 55%, and PbO 7 to 14%. Lattice constants (a_0) generally increase with increasing thorium content and range from 5.449 to 5.564 angstroms. After heating in air at 1000°C for ten minutes the lattice constants are all reduced and more closely approach a lineal relation to the composition. The fact that none of the specimens oxidized to U_3O_8 on heating, indicates that they belong to the α group of Wasserstein. The 20 specimens are readily subdivided into three distinct groups within each of which composition, lattice constants and type of deposits are distinctive. An attempt to relate diffraction intensities of four different sets of planes to composition was inconclusive. (auth)

6656

STUDIES OF RADIOACTIVE COMPOUNDS. VIII. URANOPHANE AND BETA-URANOPHANE. D. H. Gorman and E. W. Nuffield (Univ. of Toronto, Canada). Am. Mineralogist 40, 634-45(1955) July-Aug.

Uranophane and beta-uranophane are dimorphous with composition $CaO \cdot 2UO_3 \cdot 2SiO_2 \cdot 6H_2O$ as found by Nováček (1935). Uranophane: Monoclinic, a = 15.87, b = 7.05, c = 6.66 A, β = 97° 15'; space group $P2_1/a$ or P2/a; Z = 2; SG = 3.83 (meas.), 3.85 (calc.); needle-like crystals elongated b[010]. Beta-uranophane: Monoclinic, a = 6.64, b = 15.55, c = 14.01 A, β = 91°; space group $P2_1/c$; Z = 4; SG = 3.90 (meas.), 3.93 (calc.); needle-like crystals elongated c[001]. (auth)

6657

THE URANIUM PROSPECTOR'S GUIDE. Thomas J. Ballard and Quentin E. Conklin. New York, Harper and Brothers, 1955. 251p.

6658

AIRBORNE RADIOACTIVITY SURVEY OF THE PINTO-CHINLE AREA, APACHE COUNTY, ARIZONA. GEOPHYSICAL INVESTIGATIONS MAP GP 124. J. L. Meuschke. Washington, U. S. Geological Survey, 1955. $0.50.

METALS AND METALLURGY

6659 ANL-5262

Argonne National Lab., Lemont, Ill.

ATTACK ON METALS BY BISMUTH–LEAD–TIN ALLOY AT ELEVATED TEMPERATURES. Final Report on Metallurgy Program 8.2.3. W. D. Wilkinson. Jan. 15, 1954. 73p. Contract W-31-109-eng-38.

Attack on Al, Be, Ti, Zr, irons, steels, Mo, and W by bismuth-lead-tin alloys was studied. General procedures are discussed, and results are analyzed. It was found that Mo was not attacked at 800°C and Be was not attacked at 500°C, but others were visibly attacked. The effects of oxygen on attack is also discussed. (B.J.H.)

6660 BM-RI-5144

Bureau of Mines.

A STUDY OF CONSUMABLE ELECTRODE ARC MELTING. R. A. Beall, J. O. Borg, and F. W. Wood. Aug. 1955. 29p.

A number of ingots were cast by the consumable electrode arc process to study the effect of several variables of operation. The study has shown that molten pool volume is a function of both input power and furnace atmosphere. It has been shown that pool volume depends directly upon the rate of electrode consumption. Melting efficiency and

metal yield efficiency are improved by using reduced pressure and straight polarity. The quality of alloy ingots would be improved by deep molten pools, promoting mixing. Therefore, reduced pressure is recommended for production of zirconium and zirconium alloy ingots. (auth)

6661 BMI-1019

Battelle Memorial Inst., Columbus, Ohio.
WELDING OF MOLYBDENUM HEAT EXCHANGERS. Robert E. Monroe and David C. Martin. July 20, 1955. 14p. Contract W-7405-eng-92.

The feasibility of producing complex welded components in currently available arc-cast molybdenum was demonstrated by the construction of simulated heat exchangers. Assemblies containing 52 tubes welded into a header sheet were completed without any failures occurring as a result of room-temperature brittleness of the welds. Identical welds were not always obtained because of factors which are apparently associated with the cone-arc welding process. The arc column does not appear to rotate as suggested in the original cone-arc theory. (auth)

6662 DF-52TL158

General Electric Co. Thomson Lab., Lynn, Mass.
CYCLIC TEMPERATURE RUPTURE TESTS. Part 1. J. Miller. June 27, 1952. 18p.

The rupture life of resisting alloys under cyclic temperature conditions is investigated. The actual rupture life of S816 and M252 subjected to intermittent "square wave" temperature cycles agreed with the calculated life. The life under continuous "sawtooth" temperature cycles was found to be somewhat less than the calculated life for these conditions. (auth)

6663 TAM-82

Illinois. Univ., Urbana.
TORSIONAL PROPERTIES OF STEELS AT HIGH RATES OF STRAIN. P. G. Jones and T. J. Dolan. Apr. 1955. 73p. Final Report on Contract N6ori-071(49).

An experimental study was made on four steels to determine the effect of rate of strain, temperature, sharpness of notch, and size of specimen on the mechanical properties in torsion. Unnotched and notched round specimens were tested in torsion at −100°F, room temperature, and 700°F using nominal rates of twist of 0.5, 27, and 1300 rpm. Values of torque, angle of twist, and time were continuously recorded automatically to provide data from which the torsional properties were computed. A study was also made of the elastic strain energy and the energy required for plastic deformation and crack propagation in order to have a better understanding of the conditions governing the onset of unstable fracturing. An analysis of the experimental data was made and the conclusions are summarized. (auth)

6664 TID-5277

Atomic Energy Commission, Washington, D. C. and Bureau of Ships.
LIQUID METALS HANDBOOK. SODIUM–NaK SUPPLEMENT. Carey B. Jackson, ed. July 1, 1955. 452p.

This supplement to the Liquid Metals Handbook includes information specifically on Na and Na-K alloys. Discussions are presented on chemical and physical properties, heat transfer, chemical engineering aspects, heat transfer systems and components, and safety measures. Specific applications of Na and Na-K alloys as heat-transfer agents are outlined. (C.W.H.)

6665 UCRL-4508

California. Univ., Livermore. Radiation Lab.
INTERMETALLIC COMPOUNDS BETWEEN LITHIUM AND LEAD. I. THE STRUCTURES OF Li_3Pb AND Li_7Pb_2. Allan Zalkin and William J. Ramsey. May 13, 1955. 16p. Contract W-7405-eng-48.

The crystal structures of Li_3Pb and Li_7Pb_2 have been determined. The Li_3Pb cell is face-centered cubic with a = 6.687 A; the Li_7Pb_2 cell is hexagonal with a = 4.751 A and c = 8.589 A. Two other compounds with Li/Pb mole ratios of approximately 2.5 and 4.0 have been characterized by cooling-curve data and by x-ray diffraction patterns. The arrangement of the atoms in Li_3Pb is similar to that in lithium metal with the appropriate number of lithium atoms replaced by lead atoms; Li_7Pb_2 has a similar but slightly modified arrangement. (auth)

6666 WADC-TR-54-183

Stevens Inst. of Tech., Hoboken, N. J.
THE INVESTIGATION OF POROUS MEDIA. PREPARED FROM SPHERICAL METAL POWDER PARTICLES. Frank W. Heck, Donald P. Ferriss, Lambert H. Mott, and Gregory J. Comstock. Mar. 1955. 261p. Project title: EXTERNAL AND INTERNAL AERODYNAMICS. Task title: PROPERTIES OF POROUS METALS. Contract AF33(616)-396.

The processing of spherical stainless steel powder particles by compacting and sintering methods is described. Room temperature air permeability and tensile strength and stress rupture data at 1100°F are reported. Porous specimens were prepared from six particle size fractions to densities ranging from 75% to 90% of the density of the solid material and the thicknesses ranging from 0.040 to 0.200 inch by various combinations of compacting and coining pressures. Sintering time, temperature, and atmosphere were held constant. Methods of separating spherical particles from an aggregate of particle shapes are discussed. The permeability data are presented in the form of a D'Arcy coefficient of permeability and also as a relationship between the pressure differential across the compact and the volumetric rate of air flow through the compact. (auth)

6667

COMPRESSION OF THE ALKALI METALS TO 10,000 ATMOSPHERES AT LOW TEMPERATURE. C. A. Swenson (Massachusetts Inst. of Tech., Cambridge). Phys. Rev. 99, 423-30(1955) July 15.

A technique originally developed by Bridgman has been used to measure the total compressions of the alkali metals (Li, Na, K, Rb, and Cs) for pressures up to 10,000 atmospheres at 4.2° and 77°K. The unusual features found were an abnormally low decrease in compressibility with pressure for cesium, probably connected with a smearing out of the electronic transition found at 45,000 atm. at room temperature, and a possible transformation in rubidium at 77°K which resulted in a permanent increase in the room temperature density of about ten percent. A comparison of these data with theoretical work by Bardeen shows better agreement than was obtained with an extrapolation of room temperature data to absolute zero, although the agreement is satisfactory only for sodium. Approximate densities also were obtained at these temperatures, and the agreement with unpublished calculations by Brooks is excellent for all the metals except lithium, where a deviation could be expected to occur. (auth)

6668

LIQUID METALS. PART II. THE SURFACE TENSION OF LIQUID SODIUM: THE DROP-VOLUME TECHNIQUE. C. C. Addison, W. E. Addison, D. H. Kerridge, and J. Lewis (Univ. of Nottingham, England). J. Chem. Soc. 2262-4(1955) July.

The surface tension of liquid Na in an atmosphere of pure A has been measured over the temperature range 110 to 220°C by a drop-volume method. The temperature coefficient of tension is 0.1 dyne/cm/degree, and extrapolation of results to the melting point of Na gives $\gamma = 202$ dynes/cm. Results are compared with those obtained by the vertical-plate method. (Part I appears in J. Chem. Soc., 2861-6(1954) Aug.) (auth)

6669

THE SURFACE ENERGIES OF THE ALKALI METALS. J. W. Taylor (Atomic Energy Research Establishment, Harwell, Berks, England). Phil. Mag. (7), 46, 867-76(1955) Aug.

The surface energies of the alkali metals sodium, potassium and lithium and their temperature coefficients have been measured experimentally. The values for lithium and sodium are in good agreement with similar theoretically calculated surface energies obtained by Stratton (Phil. Mag. 44, 519, 1236(1953)). The disparity between the experimental and theoretical surface energy values for potassium and that between the experimental and theoretical temperature coefficients of the three metals is discussed. (auth)

6670

MAINTENANCE WELDING AND CUTTING OPERATIONS ON RADIOACTIVE PROCESS EQUIPMENT. E. B. Lavelle and J. M. Fox, Jr. (Hanford Atomic Products Operation, Richland, Wash.). Welding J. (N. Y.) 34, 731-40(1955) Aug.

Detailed preparations using protective clothing and devices, timed movements, and rehearsed steps to protect personnel and to assure satisfactory maintenance welding operations on radioactive process equipment are discussed. (J.E.D.)

6671

EFFECT OF PRETREATMENT OF MARTENSITE ON SUBSEQUENT GRAPHITIZATION AT 1200°F. G. V. Smith, E. J. Dulis, and B. W. Royle (U. S. Steel Corp., Kearny, N. J.). Welding J. (N. Y.) 34, 374s-8s(1955) Aug.

A martensitic eutectoid steel was found to form many more nodules of graphite at 1200°F if first exposed in the range 800 to 1000°F, suggesting a possible relation between the high susceptibility of martensite to graphitization and the transition from epsilon carbide to cementite (Fe_3C). The steel could be completely graphitized at 1200°F in 100 days, and showed an unusual reaction curve such that the rate slowed markedly after 5 days exposure. (auth)

6672

UNIFORM NOTATION SYSTEM FOR PRESSURE-VESSEL SHELL THEORY. Welding J. (N. Y.) 34, 393s-5s(1955) Aug.

A final revision incorporating the comments and suggestions of leading authorities in the fields of shell design and structural mechanics is presented. The intent of this paper is to simplify the reading of shell theory literature and to facilitate communication among investigators in these fields. Definitions of terms and standard symbols are given for shells of revolution in general and also for the right circular cylinder. It is felt that necessary modifications of this notation for special shapes and types of loading can best be given in a specific context. (auth)

6673

PENETRATION OF MOLTEN TITANIUM IN GRAPHITE. V. P. Elyutin, M. A. Maurakh, and Yu. A. Pavlov (Moscow). Izvest. Akad. Nauk S.S.S.R. Otdel. Tekh. Nauk, No. 5, 129-32(1955) May. (In Russian)

6674

THE INITIAL OXIDATION OF NICKEL. Ursula M. Martius (Ontario Research Foundation, Toronto, Canada). Can. J. Phys. 33, 466-72(1955) Aug.

This paper describes the first stages of oxidation of nickel. Under suitable experimental conditions small isolated crystallites are formed prior to the occurrence of a continuous oxide film. The shape, size, and number of the crystallites depends on the crystallographic orientation of the underlying metal. The specific features of the oxidation of grain boundaries are discussed, and a tentative explanation of the observed phenomena is advanced. (auth)

6675

TOXIC MATERIALS MACHINED SAFELY. Donald P. O'Neil (Argonne National Lab., Lemont, Ill.). Am. Machinist 99, No. 14, 125-9(1955) July 4.

Hoods and air cleaning equipment are described for use in rooms where Be is machined. The toxic effects of Be are reviewed briefly and rules are included for the safe handling of Be. (C.H.)

6676

MANGANESE. A. H. Sully. New York, Academic Press Inc., 1955. 305p.

The history, occurrence, and classification of manganese ores are described. The commercial production of Mn and the recovery of Mn from slag and low-grade ore are outlined. Physical properties of Mn and several of its alloys are reported. Some chemical properties and applications of Mn are included. (C.W.H.)

PHYSICS

6677 NBS-1632

National Bureau of Standards. Office of Basic Instrumentation, Washington, D. C.

A MAGNETOSTRICTION MAGNETOMETER. Thomas A. Perls. May 1952. 21p. Jointly sponsored by ONR, USAF, and AEC.

Several interesting magnetic effects have been observed, including large changes in the magnetostrictively excited vibration amplitude of long rods with changes in the externally applied steady magnetic field. It was found that these changes in amplitude could not be accounted for by independently observed changes in the resonant frequency and damping of the rod, but rather were related to changes in slope of the curve of magnetostriction vs intensity of magnetization. Proposed investigations are described, including a specimen-stabilized oscillator, a determination of the most favorable annealing procedure, and the possible use of fine wires rather than long rods. (auth)

6678 NP-5733

Mine Safety Appliances Co., Callery, Penna.

RADIOACTIVE LEAK EXPERIMENT. Progress Report No. 7 [for] February 19, 1955 to March 31, 1955. Memo Report No. 80. R. J. Campana and J. W. Mausteller. Mar. 25, 1955. 20p. Contract NObs-65426.

A series of Na^{24}-contaminated water leakages in a 2000 psi-550°F system was investigated to show the effect of wall temperatures on the distribution of activity within a test compartment. A leak rate of 6.70 lph (8.86 lph at system conditions) was held for a total of 20 hr. Wall temperatures were 75 to 80°F for 8 hr, raised to 115°F over the next 8 hr, and cooled to 75°F over the next 4 hr. An average equilibrium air activity level was 80 to 90 $\mu\mu c/ml$ for the entire experiment, a factor of ~10 higher than obtained in other tests. Wall temperature variations seemed to have a sharp transitory effect on the air activity level, but no permanent effect. There was additional evidence that the character of the leak has a drastic influence on the equilibrium air activity. The leak rate was quite stable, with the leak rate instruments operating satisfactorily. Decontamination across the leak was slight, if present at all. The ratio of activity expected to leak to the activity actually leaked equals 1.11 at the maximum. (auth)

6679 NP-5734

Shell Development Co., Emeryville, Calif.

AN INVESTIGATION OF GREASE LUBRICATION PHENOMENA IN OPEN, SHIELDED AND SEALED ANTI-FRICTION BEARINGS. (Cover carries title: GREASE LUBRICATION OF HIGH SPEED ANTI-FRICTION BEARINGS). Quarterly Progress Report No. 3 for January through March 1955. J. B. Accinelli, C. R. Greene, W. H. Peterson, and P. H. Williams. 30p. Contract AF33(616)-2443, Supplemental Agreement No. 83(55-972). (S-13641)

A comparative rating between sixteen commercial greases was made on the basis of three criteria: their adherence to metal, oil holding ability, and gel structure strength. The experimental results from the centrifuge studies are directed toward obtaining a working hypothesis of normal grease structure. Oils of predominantly aromatic character are more firmly held than non-aromatic oils. The nature of the gelling agent determines the flow properties of the grease system. Inorganic gelling agents give rise to greases that exhibit plastic flow, while greases gelled with soaps show an elastic flow like a metal. The changes in adherence at different temperatures suggest that no grease, per se, will adhere to the moving elements in a bearing at 1.0×10^6DN. The rate of oil loss and the gel structure strength at different temperatures and under different centrifugal forces have been determined. (auth)

6680 AEC-tr-2202

THEORY OF THE ANOMALOUS SKIN-EFFECT IN A MAGNETIC FIELD. M. Ya. Azbel and M. I. Kaganov. Translated from Doklady Akad. Nauk S.S.S.R. 95, 41-44 (1954). 5p. Available from Associated Technical Services (Trans. 32G6R), East Orange, N. J.

The theory of the anomalous skin-effect in a magnetic field is examined for the case of reflection of a plane monochromatic wave from the surface of a metal placed in a constant magnetic field. (B.J.H.)

6681 AEC-tr-2208

REGARDING THE PAPER BY N. G. DENISOV ENTITLED "THE PROPAGATION OF ELECTROMAGNETIC SIGNALS IN AN IONIZED GAS". P. I. Kuznetsov. REPLY TO THE LETTER OF P. I. KUZNETSOV REGARDING THE ARTICLES BY N. B. DENISOV. N. G. Denisov. Translated from Zhur. Eksptl'. i Teoret. Fiz. 24, 368(1953). 2p. Available from Associated Technical Services (Trans. 56G6R a-b), East Orange, N. J.

6682 AEC-tr-2210

FARADAY EFFECT AT CENTIMETER WAVES. N. Neprimerov. Translated from Zhur. Eksptl'. i Teoret. Fiz. 26, 511(1954). 2p. Available from Associated Technical Services (Trans. 91G6R), East Orange, N. J.

A twelve-pole waveguide junction apparatus has been constructed for observing the effect of rotating the plane of polarization in a series of Fe salts. Curves of the dependence of the angle of rotation of the plane on the magnitude of the applied field are shown. (D.E.B.)

6683 TIB/T4333

CAPILLARY CONDENSATION OF VAPOURS AND STRUCTURE OF THE PORES IN ACTIVE CARBONS. (Kapillyarnaya Kondensatsiya Parov i Structura Por Aktivnykh Uglei). N. N. Avgul, O. M. Dzhigit, and A. V. Kiselev. Translated from Doklady Akad. Nauk S.S.S.R. 89, 97-9(1953). 4p.

In order to gain information on the mechanism of capillary condensation in active carbons, the adsorption of water and other vapors on non-porous active carbons was studied and compared to adsorption on large-pored carbons. Adsorption isotherms of water vapor, and vapors of methyl alcohol, butyl alcohol, benzene, and heptane on lampblack are given. (B.J.H.)

6684

THE ATOMIC HEAT OF SODIUM. D. H. Parkinson and J. E. Quarrington (Radar Research Establishment, Great Malvern, Worcs., England). Proc. Phys. Soc. London 68A, Pt. 8, 762-3(1955) Aug. 1.

In experimental study of the alkali metals in the temperature range 1.4 to 20°K, the specific heat curve of Na was found to be smooth rather than humped in the region of 7°K as had been reported. An electronic specific heat of 0.00043 T cal $(g\ atom)^{-1}\ deg^{-1}$ was deduced. (D.E.B.)

6685

ATOMIC AND NUCLEAR PHYSICS. Robert S. Shankland. New York, Macmillan Co., 1955. 529p.

This textbook has been prepared by the author from notes used in teaching a course in atomic and nuclear physics at Case Institute of Technology. The text, designed for undergraduates and first-year graduates, deals with both electronic structure and nuclear properties of matter. A generous selection of experiments is included. (D.E.B.)

AEROSOLS

6686 CR-HP-577

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.

THE ANNULAR IMPACTOR. G. W. C. Tait. June 22, 1955. 14p. (AECL-130)

An air sampling device is described based on the impaction principle. It differs from previous instruments in being capable of sampling at very high rates of the order of 700 liters/min. This has been achieved by using a very simple arrangement of the impactor parts with the jet in the form of an annular ribbon. It appears particularly useful for application to the sampling of dusts containing long lived α emitters. Such dusts heretofore had been difficult to assess due to the presence of appreciable concentrations of natural radon decay products. The impaction device differentiates sharply between most relatively coarse industrial dusts and the finer natural dust on the basis of a separation between particles greater than and those less

than 0.5 microns diameter. Good discrimination is achieved since dusts arising from most technical processes have a mass median well over one micron whereas radon decay products have been found elsewhere to be preferentially associated with particles less than 0.04 microns diameter. Results of field testing are given. (auth)

ASTROPHYSICS

6687

RADIATION FLUX FIELD OUTSIDE OF STARS AND SPHERICAL REACTORS. M. A. Melvin (Florida State Univ., Tallahassee). Phys. Rev. 99, 371-5(1955) July 15.

The energy density U, flux density F, and pressure P in the field of a hot spherical system, are here investigated along with their neutron-flux analogs. General expressions for U, F, and P are obtained and evaluated in particular (1) outside of spherical bodies radiating according to Lambert's law of isotropic radiance, I = constant, and (2) outside of stars or spherical reactors. Radiative (or transport) balance within a star (or reactor) leads to an angularly dependent radiance, $I(\cos\theta)$, from the outer surface. Assuming I to be given up to quadratic terms in $\cos\theta$, analytic expressions for U and P are obtained. It is further shown how one may use known exact numerical values for the radiance and its derivatives, at $\cos\theta = 0$ and 1, to give still better analytic representations. For many purposes where one wishes to carry out calculations involving U or P, it is convenient to have simple analytic approximations for these quantities; such approximations are here given in the form of simple Lambert-law expressions multiplied by suitable factors. (auth)

COSMIC RADIATION

6688

ABSORPTION ANALYSIS OF STAR EMITTED COMPONENTS OF COSMIC RAYS. K. H.-Höcker, H. Kuhn and M. Ritzi (Physik der Technischen Hochschule, Stuttgart, Germany.). Z. Naturforsch. 10a, 386-94(1955) May.

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

6689 WADC-TR-54-248

Philco Corp., Philadelphia.

HANDBOOK OF PIEZOELECTRIC CRYSTALS FOR RADIO EQUIPMENT DESIGNERS. John P. Buchanan. Dec. 1954. 597p. Contract AF-33(616)-191. (AD-55551)

A comprehensive manual of piezoelectric control of radio frequencies is offered. It is directed toward the design of oscillator circuits having optimum operating conditions when employing Military Standard crystal units. Included is a survey of the development of the piezoelectric crystal art; descriptions and characteristics of all crystal elements and mounting methods that have found commercial application; a detailed study of the equivalent circuit characteristics of crystal units; analyses of basic piezoelectric oscillator principles and of the effects of changes in various circuit parameters, using the Pierce oscillator as a reference circuit; analyses and recommended design procedures for all types of piezoelectric oscillator circuits used, or tested for use, in USAF equipments; schematic diagrams and tables giving actual circuit parameters of all available nonclassified piezoelectric oscillators now being used in USAF equipments; descriptions of all crystal units and crystal holders now being used in USAF equipments, containing references and schematics of circuits employing those crystal units recommended for equipments of new design; a brief discussion of crystal ovens and descriptions of ovens currently available for use with Military Standard crystal units; and a comprehensive index to increase the utility of the handbook as a reference manual. Circuit analyses, derivations of equations, and suggestions for design innovations whose sources are not directly acknowledged have originated with the author and so far as is known have not been specifically confirmed in practice. (auth)

6690

THE CELLULAR METHOD FOR A CLOSE-PACKED HEXAGONAL LATTICE, WITH APPLICATIONS TO TITANIUM. B. Schiff (Imperial Coll., London, England). Proc. Phys. Soc. London 68A, Pt. 8, 686-95(1955) Aug. 1.

The cellular method for obtaining electronic eigenvalues in crystals is formally extended to the close-packed hexagonal lattice, and the use of a double atomic cell is investigated, boundary conditions being obtained for a wave function with an arbitrary wave vector. The symmetry properties of wave functions at the zone center are outlined. After calculating a potential function for the titanium ion-core, point boundary conditions are applied to determine eigenvalues for low-lying states at the center of the zone in both modifications of the metal. The ground state is found to possess s-like symmetry in both cases. (auth)

6691

ON THE DETERMINATION OF THE ATOMIC SCATTERING FACTORS ON THE BASIS OF THE MEASURED STRUCTURE FACTORS BY USING FOURIER SERIES. Unto Korhonen. Ann. Acad. Sci. Fennicae, Ser. A I, No. 182, 6p, 1955.

A method is outlined for calculation of the atomic scattering factors of a single lattice point in a crystal by means of measured structure factors. (B.J.H.)

6692

OPTICAL BLEACHING OF F CENTERS IN X-RAYED ALKALI HALIDE CRYSTALS. Robert Herman and Richard F. Wallis (Johns Hopkins Univ., Silver Spring, Md.). Phys. Rev. 99, 435-42(1955) July 15.

When F light is absorbed by F centers it is assumed that electrons leave negative-ion vacancies and are transferred to the conduction band. Conduction electrons may be captured by holes and by negative ion vacancies. It is assumed that the cross sections for the latter two processes are equal and that the conduction electron concentration is small and stationary. Under these conditions the local F-center concentration, n, is specified by the equation $\partial n/\partial t = -bIn^2$, where I is the local F-light intensity assumed to be given by the Beer-Lambert law and b is a constant. Exact expressions for n and I have been obtained for the case of a uniform initial F-center distribution. The theoretical results are compared with quantitative measurements of the F-center concentration as a function of F-light irradiation time in x-rayed NaCl for a range of incident light intensities and initial F-center concentrations. It is found that the behavior of the model is consistent with experimental data in lightly x-rayed crystals having initial concentrations in the range $\sim 10^{16} - \sim 10^{17}$ cm^{-3}. In more heavily x-rayed crystals, appreciable growth of M and R bands occurs during the

bleaching and deviations from the behavior of the model are observed. (auth)

ELECTRICAL DISCHARGE

6693 AEC-tr-2198

THE SPARKING POTENTIAL IN MERCURY VAPOR. L. G. Guseva and B. N. Klyarfel'd. Translated from Zhur. Tekh. Fiz. 24, 1169-78(1954). 9p. Available from Associated Technical Services (Trans. 52G6R), East Orange, N. J.

The sparking potential in mercury vapor was investigated up to 160 kv, corresponding to a value of p_0d equal to 0.036 mm Hg·cm. An investigation of elementary processes taking place at very low pressures shows that there exists a sufficiently good agreement between the constants of these processes and the shape of the left branch of the sparking potential curve. In the region of 300 to 8000 volts the sparking potential curve has a complicated bend, analogous to the bend found by Penning in helium. (auth)

6694 AEC-tr-2199

LOW-FREQUENCY PLASMA OSCILLATIONS. G. V. Gordeev. Translated from Zhur. Eksptl'. i Teoret. Fiz. 27, 19-23(1954). 6p. Available from Associated Technical Services (Trans 28G6R), East Orange, N. J.

Low-frequency plasma oscillations were studied. The derivation of the dispersion equation for plasma oscillations in a constant electric field is given. It is shown that in the presence of a constant external electric field, undamped plasma oscillations are possible. (auth)

6695

ON THE RELATIVISTIC OSCILLATIONS OF PLASMA. A. Akhiezer and R. Polovin. Doklady Akad. Nauk S.S.S.R. 102, 919-20(1955) June 11. (In Russian)

6696

THE TRANSFER OF METAL BETWEEN ELECTRODES IN A HIGH VACUUM ON APPLICATION OF A HIGH ELECTRIC FIELD. P. F. Browne (Trinity Coll. Univ. of Dublin, Ireland). Proc. Phys. Soc. London 68B, Pt. 8, 564-6(1955) Aug. 1.

Radioactive cobalt, cadmium, and polonium are used to investigate the transfer of metal between electrodes in a high vacuum on application of a high electric field. Several types of metal transfer were observed and are discussed. (D.E.B.)

ELECTRONS

6697

ELECTRON CAPTURE IN THE DECAY OF SODIUM 22. R. A. Allen (Atomic Energy Research Establishment, Harwell, Berks, England), W. E. Burcham, K. F. Chackett, G. L. Munday, and P. Reasbeck (Univ. of Birmingham, England). Proc. Phys. Soc. London 68A, Pt. 8, 681-5(1955) Aug. 1.

The fraction of electron capture transitions in the decay of Na^{22} has been found by comparing the rate of evolution of Ne^{22} from a source of Na^{22} with the rate of emission of positrons. The ratio of electron capture to positron transitions is found to be 0.122 ± 0.010; a possible systematic error in the Ne^{22} determination would increase this figure. (auth)

6698

BIPARTITION ANGLES FOR COMPTON SCATTERING BY FREE ELECTRONS. H. M. Childers and J. D. Graves (Naval Research Lab., Washington, D. C.). Phys. Rev. 99, 343-5(1955) July 15.

In the Compton scattering of free electrons, the bipartition angles for the number of scattered photons, the number of secondary electrons, the energy of scattered photons, and the energy of the secondary electrons have been tabulated in terms of the incident photon energy from 10 kev to 10 Mev. (The bipartition angle for a quantity is the half angle of the cone into which one half of that quantity is scattered.) The average scattered photon energy and the average Compton electron energy have also been computed. In addition, a relation is given for the probability that the Compton electron energy will fall into the energy interval (E_1, E_2). (auth)

6699

DISTRIBUTION OF ELECTRONS SCATTERED BY GOLD. L. Marton, J. Arol Simpson, and T. F. McCraw (National Bureau of Standards, Washington, D. C.). Phys. Rev. 99, 495-9(1955) July 15.

The distribution and angle of 20-kev electrons scattered by gold has been measured. The energy resolution is better than 0.1 percent and the angular resolution better than 10^{-1} radian. Data are presented for gold of different thickness and degree of crystal orientation and for grazing angle reflection. (auth)

6700

ELECTRON LOSS CROSS SECTIONS FOR HELIUM ATOMS PASSING THROUGH GASES. Sol Krasner (Institute for Nuclear Studies, Chicago). Phys. Rev. 99, 520-6(1955) July 15.

Neutral helium atoms having kinetic energies in the range 100 to 450 kev are passed through a gas cell in which there is an intense magnetic field. When a few microns pressure of gas is admitted to the cell, an attenuation of the transmitted beam takes place, due to collisions in which the helium atoms become ionized, and removed from the unidirectional beam by the magnetic field. The method will not distinguish between collisions in which one or both helium electrons are lost. The sum of the cross sections for the two processes is measured, per atom of gas traversed. The cross sections rise in a rather uniform manner as energy increases in this range. In units of 10^{-17} cm^2 per atom of gas traversed, the values at 100 and 450 kev are: for air, 30.2 ± 0.8 and 43.9 ± 1.5; for hydrogen, 5.8 ± 0.6 and 12.5 ± 0.8; and for helium, 11.6 ± 0.6 and 16.8 ± 0.4. (auth)

GASES

6701 OSR-TN-54-260

Brown Univ., Providence.

ON AN APPROXIMATION METHOD FOR PLANE GAS FLOWS. David A. Beckwith. Oct. 1954. 41p. Project Code R354-10-55. Contract AF18(600)-1021. (AD-44389)

An ensemble of fictitious gases is deduced, for which the hodograph flow equations can be integrated by the method of Laplace-Darboux. The gas laws contain 1, 2, 3, . . . , free parameters, which may be disposed so as to approximate the law of a real gas over a supersonic or subsonic domain. (auth)

6702 AEC-tr-2201
CONCENTRATIONS OF IONS IN A THERMALLY IONIZED GAS AS A FUNCTION OF PRESSURE. B. Timan. Translated from Doklady Akad. Nauk S.S.S.R. 97, 1013-14 (1954). 3p. Available from Associated Technical Services (Trans. 33G6R), East Orange, N. J.

An investigation is made of the influence of gaseous ion interactions, in various degrees of ionization, on their equilibrium concentrations. Equations are derived which give the ion concentration as a function of gas pressure. (B.J.H.)

INSTRUMENTS

6703 A-55-1(PU)
Purdue Univ., Lafayette, Ind. School of Aeronautics.
CALIBRATION OF A HOT WIRE ANEMOMETER FOR LOW VELOCITIES IN STEADY FLOW WITH TEMPERATURE GRADIENTS. Leslie A. Hromas and C. Pawel Kentzer. July 1955. 33p. Project Ae-24. Contract DA-33-008-ord-888.

An experimental investigation was made of the characteristics of hot wire anemometers suitable for use at low speeds and elevated air temperatures. Separate studies were made for both room temperature and elevated temperatures. Velocities considered ranged from zero to 10 fps. The air temperature was varied from room conditions to 400°F. Whirling arms in cylindrical chambers were used for all calibrations. Temperature dependent corrections due to swirl were evaluated and subtracted from the measured probe speed. The hot wire was calibrated for use as a resistance thermometer. Velocity calibration data for various air temperatures were correlated by Nusselt number as a function of Reynolds number. With these calibration data, it is possible to measure temperature and velocity profiles in a steady flow. (auth)

6704 ANL-5221
Argonne National Lab., Lemont, Ill.
A DIFFERENTIAL DILATOMETER FOR RAPID DETERMINATION OF THERMAL EXPANSION COEFFICIENTS NEAR ROOM TEMPERATURE. R. M. Mayfield. July 14, 1953. 17p. Contract W-31-109-eng-38.

Descriptions are given of design, calibration, operation, and limitations of a mechanical type of differential dilatometer for rapid determinations of thermal expansion near room temperature. It is applicable to analysis of expansion characteristics with metallurgical treatment. (B.J.H.)

6705 CREL-597
Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.
REACTOR XENON POISON SIMULATOR. F. S. Goulding and A. G. Ward. May 24, 1955. 20p. (AECL-191)

A poison simulator is described which performs a continuous calculation during the operation of a reactor. The simulator was designed to assist in the analysis of experiments on the NRX reactor and has been retained as an integral and useful part of the equipment. (J.E.D.)

6706 LA-1917
Los Alamos Scientific Lab., N. Mex.
100-CHANNEL PULSE HEIGHT ANALYZER USING DELAY LINE STORAGE. J. D. Gallagher, J. L. McKibben, and H. J. Lang. May 1955. 31p. Contract W-7405-eng-36.

A fast but economical pulse height analyzer has been built and is in operation. The analyzer has 100 channels with a capacity of 99,999 counts per channel. The threshold and channel width are readily adjusted, the latter having 1, 0.5, or 0.2 volt widths. The design of the analyzer follows closely that of Hutchinson and Scarrott; however, some improvements have been incorporated to improve the reliability and utility. Data may be read from a simple coded decimal display on the face of a cathode ray tube or obtained in a shorter time by automatic print-out. (auth)

6707 NBS-2387
National Bureau of Standards. Office of Basic Instrumentation, Washington, D. C.
THE DEVELOPMENT OF A SUBLIMING CARBON DIOXIDE ALTIMETER. A. S. Iberall and S. B. Garfinkel. Mar. 1953. 50p. Jointly sponsored by ONR, ARDC, and AEC.

Results are presented from an investigation of the feasibility of utilizing the vapor pressure-temperature relationship of subliming carbon dioxide snow in a continuous stream as a basis for a wide-range altimeter. Laws are formulated governing the application of a subliming solid for obtaining pressure-altitude in the upper air as a function of the measured temperature of the vapor pressure in equilibrium with the ambient air. (auth)

6708 NBS-2783
National Bureau of Standards, Washington, D. C.
AN ELECTRONIC POWER SWITCH. Jack Sargent. Aug. 28, 1953. 15p. Sponsored by ONR, U. S. Air Force, and AEC under a cooperative program of Office of Basic Instrumentation (NBS).

An electronic method is presented for rapidly quenching a conducting thyraton so that it may satisfactorily be used as a switch. The desirable features obtained from this circuit are (a) fast rise and cut-off time (less than 0.25 microsecond), (b) conduction of currents in the ampere range, (c) rapid switching rates (repetition frequency from zero to 10,000 cps), and (d) wide variation in pulse width (a minimum width of one microsecond and a maximum width limited by the time interval between rectangular pulses of 50 microseconds at any repetition frequency). Design considerations and an example are included. (auth)

6709 NBS-3924
National Bureau of Standards. Office of Basic Instrumentation, Washington, D. C.
A METHOD FOR STEADY-STATE ACCELEROMETER CALIBRATIONS UP TO ±4000 g AND TEST RESULTS ON TWO ACCELEROMETERS, MODEL A314-T. (Manufactured by the Gulton Mfg. Corp., Metuchen, N. J.). Thomas A. Perls, Charles W. Kissinger, and Donald R. Paquette. Mar. 1955. 20p. Jointly sponsored by ONR, OSR, and AEC.

A steady-state method was developed for calibrating small vibration pickups at accelerations up to ±4000 g. This method was used in obtaining calibrations at peak accelerations up to ±2000 g for two commercial $BaTiO_3$ accelerometers, Gulton Model A-314 T. The average scatter of the sensitivity data was ±1.5%. Within this accuracy, the two accelerometers were linear up to the highest acceleration tested. Data on transverse response, resonant frequency, and temperature effects over a small range near room temperature are also included. (auth)

6710 UCRL-2994
California. Univ., Berkeley. Radiation Lab.
THE USE OF BISMUTH WIRE FLUXMETER FOR METER-

ING THE MAGNETIC FIELD OF THE CONSOLIDATED MASS SPECTROMETER MODEL 21-103. Amos S. Newton and Herbert X. DiGrazia. May 17, 1955. 19p. Contract W-7405-eng-48.

The use of a bismuth wire coil for measuring the magnetic field in the Consolidated Engineering Corporation mass spectrometer is described. The resistance of the bismuth coil, which is kept at liquid nitrogen temperature, is calibrated against the field by measuring the mass and voltage of known materials. Assuming a radius of curvature (5 inches) this can be converted to a calibration of resistance vs field in gauss. The bridge circuit for measuring the resistance and the sensitivity of the measurement (0.1 gauss in the 2000- to 4000-gauss region) is discussed, and the stability of the setup in terms of drift, temperature cycling of the coil, and effect of room temperature are described. The use of the instrument for checking the field setting in normal operation, mass identification of peaks of unknown mass, and locating a given mass at a given voltage for appearance potential or voltage discrimination studies is discussed. (auth)

6711 NBS-1691

TRANSLATION OF PAPERS ON STABILITY OF NON-LINEAR FEEDBACK CONTROL SYSTEMS. May 29, 1952. 80p.

Separate abstracts have been written for the individual papers in this report. (B.J.H.)

6712 NBS-1691(p.1-40)

ON SOME NON-LINEAR PHENOMENA IN REGULATORY SYSTEMS. L. S. Goldfarb. Translated from Avtomat. i Telemekhan. 8, 349-83(1947) Sept.-Oct. 43p.

A method of approximation to the solution of the problem of limited motion movements in a non-linear control system is described. The concept of the equivalent admittance of the non-linear element is introduced, and its magnitude is defined for a series of non-linear characteristics frequently encountered in regulating systems. A series of concrete examples, such as effect of dry friction, effect of clearance, etc., are given. (B.J.H.)

6713 NBS-1691(p.41-60)

ON THE COMPUTATION OF RELAY SERVOMECHANISMS. E. Y. Lechtman. Translated from Avtomat. i Telemekhan. 12, 15-27(1951) Jan.-Feb. 20p.

Simplified computation methods for relay servomechanisms based on the harmonic balance method of L. C. Goldfarb are given. The time constant of the amplifier, the delay of the relay, and the width of the insensitive range are taken into account. The formulas obtained agree with the exact solutions. (B.J.H.)

6714 NBS-1691(p.61-75)

LOCUS CURVE METHOD FOR REGULATORS WITH FRICTION. Winfried Oppelt. Translated from Z. Ver. deut. Ing. 90, 179-83(1948) June. 15p.

Friction in the detector or transmission may change the motion in a regulator system considerably. Loci are given for components, and the stability of regulation is investigated. (auth)

6715

BRITISH EQUIPMENT AT GENEVA. I. Atomics 6, 219-28 (1955) Aug.

A survey is given of the British equipment exhibited at the Geneva Conference. Included are descriptions of radiation monitors and ratemeters, scintillation counters, probe units, and oscillographs, for example. Other exhibits are also surveyed. (B.J.H.)

6716

RADIOACTIVE WASTE DISPOSAL. Atomics 6, 232(1955) Aug.

A description is given of a rotary, continuous type vacuum filter to be used in conjunction with other devices for the removal of radioactive contaminated matter from biologically treated wastes. (B.J.H.)

6717

MONOISOTOPIC LIGHT SOURCES IN METEOROLOGY. N. R. Batarchukova. Uspekhi Fiz. Nauk 56, 265-82(1955) June. (In Russian)

The use of Hg^{198}, Hg^{202}, Kr^{84}, Kr^{86}, Cd^{112}, Cd^{114}, and Cd^{116} isotopes as sources of standard wave lengths is reviewed. 43 references. (G.Y.)

6718

A SIMPLE METHOD OF MEASURING THE DYNAMIC YOUNG'S MODULUS OF CONCRETE. J. P. A. Lochner and W. de V. Keet (National Physical Lab., Pretoria, South Africa). J. Sci. Instr. 32, 296-9(1955) Aug.

The dynamic Young's modulus of elasticity E of solids can conveniently be determined from the fundamental transverse frequency of bars. This article describes a very simple device, consisting of a calibrated adjustable Helmholtz resonator, the resonance of which can be observed by means of a stethoscope, for measuring the natural transverse frequency of a rod struck with a small hammer. (auth)

6719

A PORTABLE TWENTY-FOUR CHANNEL KICKSORTER. G. F. von Dardel (AB Atomenergi, Stockholm). J. Sci. Instr. 32, 302-7(1955) Aug.

A twenty-four channel kicksorter has been developed essentially on the principles of Wilkinson. The circuits contain twenty-five valves and eight relays. The whole instrument is easily portable and consists of two units, weighing 25 and 10 kg. Normal channel width is 2 v and the level of the bottom channel can be varied between 0 and 100 v. A simple stabilizing device is described which can be connected to the kicksorter for applications where a slow drift occurs. (auth)

6720

A SIMPLE MICROCALORIMETER FOR HEAT OF SOLUTION MEASUREMENTS. W. P. Hutchinson and A. G. White (Atomic Energy Research Establishment, Harwell, Berks, England). J. Sci. Instr. 32, 309-14(1955) Aug.

In an endeavor to simplify the temperature measuring equipment usually used in microcalorimetric work the performance, in a calorimeter, of five different types of thermistor has been examined. The selection of a suitable type for a given purpose, and the correct operating conditions are discussed. Details of the construction of a microcalorimeter, which uses a Dewar vessel of 50-ml capacity, and a thermistor as the temperature sensitive element, are given. Heat changes of approximately 1 cal can be measured with a precision of ±0.3%. (auth)

ISOTOPES

6721

THE TECHNIQUES USED AT THE INSTITUT DE PHYSIQUE NUCLEAIRE DE L'UNIVERSITE DE LIEGE. II. DOSAGE

FROM RADIOCARBON C^{14}. J. Govaerts. Bull. soc. roy. Liege, Nos. 9-10297-307(1954). (In French)

The preparation of C^{14} samples and some of the methods of measuring C^{14} dosage are reviewed. (B.J.H.)

MASS SPECTROGRAPHY

6722 AEC-tr-2204

APPLICATION OF MASS SPECTROMETERS WITH IMHOMOGENEOUS MAGNETIC FIELD FOR DETERMINING ATOMIC MASSES. A. V. Dubrovin and G. V. Balabina. Translated by S. D. Drell from Doklady Akad. Nauk S.S.S.R. 102, 719-21(1955). 8p.

An abstract of this paper appears in Nuclear Science Abstracts as NSA 9-5997.

6723

RAPID MASS-SPECTROMETRIC MICROMETHOD FOR ISOTOPIC ANALYSIS OF OXYGEN IN WATER. A. I. Brodskii, S. G. Demidenko, L. L. Strizhak, and V. R. Lechekhleb (Pisarzhevskii Inst. of Physical Chemistry, Kiev). Zhur. Anal. Khim. 10, 256-61(1955) July–Aug. (In Russian)

MEASURING INSTRUMENTS AND TECHNIQUES

6724 LA-1923

Los Alamos Scientific Lab., N. Mex.

A FILM-BADGE METHOD OF DIFFERENTIAL MEASUREMENT OF COMBINED THERMAL-NEUTRON AND GAMMA-RADIATION EXPOSURES. Ford Kalil. Apr. 1955. 32p. Contract W-7405-eng-36.

A body film-badge dosimeter using Du Pont 502 dental film and utilizing a 20 mil cadmium filter, a 20 mil brass filter, and an unshielded area was calibrated by exposure to combinations of thermal neutrons and gamma radiations from the thermal column of a homogeneous reactor and a radium source. A method was devised whereby combined thermal-neutron and gamma-radiation exposures can be differentiated and evaluated. The method of differentiating and evaluating the thermal-neutron exposure is accurate, provided the gamma-ray energy spectrum lies between 0.15 and 10 Mev. The gamma-radiation exposure can be accurately evaluated, provided the gamma-ray energy lies between 0.3 and 3 Mev, a range over which the film-badge response is independent of the gamma-ray energy. Beta-ray exposures, under restricted conditions, can also be roughly evaluated by previously established techniques. (auth)

6725 ORNL-332(1st Rev.)

Oak Ridge National Lab., Tenn.

APPLIED HEALTH PHYSICS RADIATION SURVEY INSTRUMENTATION [MANUAL]. D. M. Davis, E. D. Gupton, and J. C. Hart. Jan. 1, 1954. 230p. Contract W-7405-eng-26.

Radiation detection and measuring instruments used by the Applied Health Physics Section of ORNL are described. Operating characteristics, applications, calibration, and routine maintenance of each instrument are discussed. A photograph of each complete instrument and circuit diagrams for many of the instruments; a discussion of radiation types, units, and permissible exposure levels; and data on calibration devices, sources, and procedures are included. Appended are three reports by staff members: A Review of Film Dosimetry; Calibration and Dosage Determinations in Beta-Gamma-X-Ray Film Dosimetry at ORNL; and The ORNL Cutie Pie. (C.H.)

6726

INSERTION OF THE RADIOACTIVE SAMPLE INTO A BETA-RAY SPECTROMETER. F. Deutsch and J. Burde. Soc. Sci. Nat. Croat. Period. Math.-Phys. et Astron., Ser. II 9, No. 3-4, 245-9(1955). (In Croatian)

The construction details of the vacuum forechamber of a flat, magnetic lens β-ray spectrometer are described. The method of insertion of the radioactive sample into the spectrometer is also given. (B.J.H.)

6727

PHOTOMETRIC MEASUREMENT OF IONIZATION IN CLOUD CHAMBERS. I. Butterworth (Univ. of Manchester, England). Phil. Mag. (7), 46, 884-94(1955) Aug.

It has been found possible to measure the ionization of a cloud chamber track by photometry of the chamber photograph. The method is applicable to tracks, the photographic images of which consist of unresolved drop images. Its application does not interfere with accurate measurement of the magnetic rigidity of the particle causing the track. The use of the method has been investigated by studying tracks in a typical chamber and is illustrated by mass measurements on 3 K mesons. The relative merits of this photometric method and the drop counting method of measuring ionization are discussed. (auth)

6728

THE TECHNIQUES USED AT THE INSTITUT DE PHYSIQUE NUCLEAIRE DE L'UNIVERSITE DE LIEGE. III. DETERMINATION OF THE SPECIFIC ACTIVITY OF Ca^{45} BY A COLLAPSIBLE CENTRIFUGING TUBE. J. Govaerts and A. Baudrenghien. Bull. soc. roy. sci. Liège, No. 4, 90-5 (1955). (In French)

The apparatus and its operation for the measurement of Ca^{45} specific activity are described in detail and experimental results are given. (B.J.H.)

6729

THE RADIATION DOSE AROUND A CIRCULAR CYLINDER. Hans-Joachim Fiebelkorn. Strahlentherapie 97, 272-6(1955) June. (In German)

The author previously published certain sets of curves, to be used in the determination of the amount of radiant energy acting on the surface in rotation and arc therapy. In this paper, he explains how these same sets of cuves can equally be used for the purpose of calculating, with sufficient accuracy, the surface doses in convergent beam arc therapy. (auth)

6730

PHANTOMS FOR USE IN RADIATION DOSAGE DETERMINATIONS. Hubert Keim. Strahlentherapie 97, 459-60(1955) July. (In German)

Gelatin is a very suitable material out of which to make measuring phantoms that are largely adapted to conditions in the human body. The author describes the advantages of such measuring phantoms for the control of the doses delivered in arc and convergent beam therapy. (auth)

6731

CALCULATION OF FINAL THICKNESS OF EMULSION FILMS IN INVESTIGATIONS OF NUCLEAR PROCESSES BY THE USE OF PHOTOGRAPHIC METHODS. II. A. A. Bene. Zhur. Eksptl'. i Teoret. Fiz. 28, 706-10(1955) June. (In Russian)

6732

DETECTION OF THE POLARIZATION OF BEAMS OF FAST PARTICLES BY USE OF NUCLEAR EMULSIONS. E. L. Grigor'ev (Inst. of Nuclear Problems). Zhur. Eksptl'. i Teoret. Fiz. 28, 761(1955) June. (In Russian)

6733

DOSIMETRY OF X- AND γ-RAYS BY ALKALI-HALIDE CRYSTALS CONTAINING U-CENTERS. W. G. Burns and R. Lockyer (Hilger and Watts Ltd., London). J. Sci. Instr. 32, 316-19(1955) Aug.

A crystal dosimeter is described. The sensitive element is a crystal of potassium chloride containing potassium hydride in solid solution at a concentration of 5.5×10^{18} molecules potassium hydride per cm^3, and this becomes colored due to the formation of the F band on irradiation. The color is stable in the dark up to 50°C, and fades in the light sufficiently slowly for a reasonably accurate estimation of the dose to be made. The preparation of the material and tests on its sensitivity, temperature dependence, energy dependence, and rate of dosing, are described. Using a spectrophotometer, doses from ten to many thousand röntgen of γ rays have been measured. This type of dosimeter has the advantage over the radiophotoluminescent type in that a visible coloration is produced, enabling doses of 75 r and upwards to be estimated roughly without a special reader. A simple, battery-operated reader, enabling field measurement of doses from 20 to 600 r, has been made. Its characteristics make the dosimeter very suitable for a personnel flash dosimeter. (auth)

6734

PROTON RECOIL FAST-NEUTRON SPECTROMETER. PART I. PRINCIPLES. B. R. Gossick (Purdue Univ., Lafayette, Ind.). Rev. Sci. Instr. 26, 754-6(1955) Aug.

A general equation for calculating the neutron energy spectrum from proton recoil counting data is derived. This equation is optimized subject to a constant total error to determine the most favorable experimental conditions. Feasible accuracy is illustrated by presenting a family of curves of the counting time (required for one point of a spectrum) plotted against total error with source intensity as a parameter. The calculations apply only to a "good geometry" experiment with a point source. (auth)

6735

PROTON RECOIL FAST-NEUTRON SPECTROMETER. PART II. EXPERIMENTAL. R. G. Cochran and K. M. Henry (Oak Ridge National Lab., Tenn.). Rev. Sci. Instr. 26, 757-62(1955) Aug.

A triple-coincidence-type proton-recoil spectrometer has been developed for measuring neutron spectra of reactors and artificial neutron sources. The instrument is composed of a triple-section proportional counter with suitable radiator-absorber wheels, amplifiers, electronic pulse-height selectors, and a triple-coincidence circuit. Considerable effort has been made to obtain maximum sensitivity by optimizing the radiator and absorber thicknesses and the counting times, and by minimizing the background effects. Under these conditions the energy resolution obtained approaches that obtained by photographic plates. The spectrometer was calibrated by measuring monoenergetic neutrons from the ORNL Van de Graaff generator. Typical examples of spectra measurements are included. (auth)

MESONS

6736 AEC-tr-2206

PHOTOPRODUCTION OF NEGATIVE π-MESONS FROM DEUTERIUM. M. I. Adamovich, G. V. Kuzmicheva, V. G. Larionova, and S. P. Kharlamov. Translated by S. D. Drell from Doklady Akad. Nauk S.S.S.R. 102, 715-18(1955). 9p.

Photographic emulsions impregnated with heavy water and exposed to a photon beam were used to study the photoproduction of π^- mesons. Cross sections, excitation curves, and momentum distributions are given. (B.J.H.)

6737

PRODUCTION OF CHARGED π MESONS BY NUCLEONS. V. M. Sidorov. Zhur. Eksptl'. i Teoret. Fiz. 28, 727-9 (1955) June. (In Russian)

Differential cross sections and energy spectra of π^+ and π^- mesons produced by bombardment of C and H by 657 ± 8 Mev protons from the Institute of Nuclear Problems synchrocyclotron and by neutrons from Be exposed to the proton beam are presented. (G.Y.)

6738

FISSION OF HEAVY NUCLEI BY SLOW π^- MESONS. N. A. Perfilov and N. S. Ivanova (Radium Inst., Moscow). Zhur. Eksptl'. i Teoret. Fiz. 28, 732-4(1955) June. (In Russian)

Emulsions loaded with U, Pb, and W were exposed to a slow π^- meson beam. Data on energy distribution of particles from U fission are plotted. The low fission cross sections of Pb and W are discussed briefly. (G.Y.)

6739

ON THE PROBABILITY OF FISSION OF URANIUM NUCLEI BY ABSORPTION OF SLOW π^- MESONS. O. V. Lozhkin and V. P. Shamov (Radium Inst., Academy of Sciences, U.S.S.R.). Zhur. Eksptl'. i Teoret. Fiz. 28, 739-40(1955) June. (In Russian)

Two experiments on exposure of a $UO_2Na(C_2H_3O_2)_3$-loaded emulsions to a slow π^- meson beam gave fission probabilities of 0.25 ± 0.05 and 0.33 ± 0.08. (G.Y.)

6740

ON THE POSSIBLE β DECAY OF HYPERONS AND K MESONS. M. Markov and V. Stakhanov (Lebedev Physics Inst.). Zhur. Eksptl'. i Teoret. Fiz. 28, 740(1955) June. (In Russian)

6741

ON MULTIPLE PRODUCTION OF MESONS AT 1 TO 2.2 BEV ENERGIES. S. Z. Belen'kii and A. I. Nikishov (Lebedev Physics Inst.). Zhur. Eksptl'. i Teoret. Fiz. 28, 744-6(1955) June. (In Russian)

6742

PHOTOPRODUCTION OF π^0 MESONS ON DEUTERIUM. A. S. Belousov, A. V. Kutsenko, and E. I. Tamm (Lebedev Physics Inst.). Doklady Akad. Nauk S.S.S.R. 102, 921-3 (1955) June 11. (In Russian)

Relative production of $d + \pi^0$ and $p + n + \pi^0$ by synchrotron γ rays of 250 Mev maximum energy on a LiD target was determined in studying the meson-nucleon interaction. (G.Y.)

6743

TOTAL CROSS SECTION FOR INTERACTION OF NEGATIVE π MESONS WITH HYDROGEN IN THE ENERGY INTERVAL FROM 140 TO 400 MEV. A. E. Ignatenko, A. I. Mukhin, E. B. Ozerov, and B. M. Pontecorvo (Inst. of Nuclear

Problems). Doklady Akad. Nauk S.S.S.R. 103, 45-7(1955) July 1. (In Russian)

6744

HYDRODYNAMIC THEORY OF MULTIPLE PRODUCTION OF PARTICLES. S. Z. Belenskii and L. D. Landau. Uspekhi Fiz. Nauk 56, 309-48(1955) July. (In Russian)

6745

MESONS AND FIELDS. VOLUME II. MESONS. Hans A. Bethe and Frederic de Hoffmann. Evanston, Ill. or White Plains, N. Y., Row, Peterson and Co., 1955. 446p.

The general properties, spin, and parity of π mesons are discussed. Meson scattering is also discussed, including such topics as scattering of π mesons by protons, isotopic spin formalism, phase shift analysis, and low- and high-energy scattering experiments. Theoretical background, experimental work, and interpretations of photomeson production are given. Meson theory is discussed in great detail. Meson production by particles, and other mesons are discussed more briefly. (B.J.H.)

MOLECULAR PROPERTIES

6746

MELTING CURVES OF He^3, He^4, H_2, D_2, Ne, N_2, AND O_2 UP TO 3500 KG/CM^2. R. L. Mills and E. R. Grilly (Los Alamos Scientific Lab., N. Mex.). Phys. Rev. 99, 480-6 (1955) July 15.

New and more accurate measurements were made on the melting pressure-temperature relationship of seven substances below 120°K and up to 3500 kg/cm^2. New regions were covered for He^3 and O_2. The blocked-capillary method was used. The data were fitted to the Simon-type equation, $P = a + bT^c$, with more success than to a quadratic, $P = A + BT + CT^2$. Rather straightforward shifts were obtained in the melting curves of the isotope pairs, $He^3 - He^4$ and $H_2 - D_2$. Superpressuring in the O_2 measurements was unusually great. (auth)

6747

PHOTOIONIZATION EFFICIENCIES AND CROSS SECTIONS IN O_2, N_2, CO_2, A, H_2O, H_2, AND CH_4. N. Wainfan, W. C. Walker, and G. L. Weissler (Univ. of Southern California, Los Angeles). Phys. Rev. 99, 542-9(1955) July 15.

The photoionization cross sections of several gases were obtained by making simultaneous measurements of the total absorption cross sections and ionization efficiencies in the wavelength region from 473 to 1100 A. In each case the total absorption cross sections were in agreement with those reported by others. For O_2, the ionization cross sections were found to be between 5 and 30×10^{-18} cm^2, while those for N_2 were close to 23×10^{-18} cm^2 over almost the entire range studied. The ionization cross section of argon at the onset of ionization was compared with the theoretical estimate made by Dalgarno. The long-wavelength limits for photoionization were determined and were found to yield ionization potentials in good agreement with those obtained by spectroscopic and electron impact methods. (auth)

NEUTRONS

6748 ANL-5397

Argonne National Lab., Lemont, Ill.

THERMAL NEUTRON FISSION CROSS SECTION OF Pu^{241}. A. H. Jaffey, M. H. Studier, P. R. Fields, and W. C. Bentley. Mar. 31, 1955. 14p. Contract W-31-109-eng-38.

The thermal neutron fission cross section of Pu^{241} has been measured relative to that of Pu^{239} in the thermal column of the former Argonne heavy water reactor, CP-3'. The result was σ_f (2200 m/s) = 1100 ± 30 b if the Pu^{241} cross section follows a 1/v relation. (auth)

6749

A SLIDE RULE TECHNIQUE FOR CALCULATING NEUTRON ENERGIES FROM TRACKS IN NUCLEAR EMULSIONS. J. P. Scanlon (Univ. of Liverpool, England). J. Sci. Instr. 32, 308-9(1955) Aug.

The calculation of neutron energies from the ranges of proton recoils is reduced to a form suitable for use with a slide rule. The modifications required for a standard slide rule and the method of operation are described. The technique can be used for all neutron energies greater than 1 Mev. (auth)

6750

ENERGY DISTRIBUTION OF NEUTRONS SCATTERED BY PARAMAGNETIC SUBSTANCES. B. N. Brockhouse (Atomic Energy of Canada Ltd., Chalk River, Ontario). Phys. Rev. 99, 601-3(1955) July 15.

A method is described for the measurement of the energy distribution of neutrons scattered by paramagnetic substances. In particular, measurements were made on anhydrous samples of $MnSO_4$ and Mn_2O_3. (B.J.H.)

NUCLEAR PHYSICS

6751 CU-143

Columbia Univ., New York. Nuclear Physics Labs.

PROGRESS REPORT FOR JANUARY, FEBRUARY, MARCH 1954 TO THE UNITED STATES ATOMIC ENERGY COMMISSION. 19p. Contract AT-30-1-GEN-72.

Several improvements on the Nevis velocity selector are described. The neutron crystal spectrometer has been improved so as to give completely automatic operation at a given setting. The scattering of neutrons by several paramagnetic substances, MnO and MnF_2, was studied. First-forbidden matrix elements in β decay and μ-meson binding energies were calculated. A non-blocking amplifier which makes use of characteristics peculiar to secondary emission tubes is being developed. The special copper BF_3 counter was completed and tested. Investigation of the properties of the 180° β spectrometer was continued. Analysis of experimental data and theoretical implications, including the electron-neutrino angular correlation coefficient, of the "He^6 recoil" experiments was begun. Initial neutron production was obtained with the pulse transformer accelerator. (For preceding period see CU-134.) (B.J.H.)

6752

DEVIATIONS FROM THE MAYER SCHEME IN FILLING NUCLEAR SHELLS AND INTERACTION OF LEVELS. V. A. Filimonov. Zhur. Eksptl'. i Teoret. Fiz. 28, 753(1955) June. (In Russian)

6753

HIGH ENERGY NUCLEAR PHYSICS. PROCEEDINGS OF THE FIFTH ANNUAL ROCHESTER CONFERENCE HELD JANUARY 31–FEBRUARY 2, 1955. H. P. Noyes, E. M. Hafner, G. Yekutieli, and B. J. Raz, comps. and eds. New York, Interscience Publishers, Inc., 1955. 198p.

Papers are presented on several general topics including low- and high-energy pion phenomena, theoretical nuclear physics, experimental work on elementary particles, elastic scattering of nucleons, and accelerator physics. (B.J.H.)

6754

COMMENTS ON THE STATISTICAL THEORY OF NUCLEI. N. N. Kolesnikov. Doklady Akad. Nauk S.S.S.R. 103, 57-60 (1955) July 1. (In Russian)

6755

CONTRIBUTION TO THE STATISTICAL THEORY OF ATOMIC NUCLEI. W. Inthoff. Ann. Physik 15, 376-93 (1955) May. (In German)

By suitable approximation of the combined density, an equation for the nucleus, analogous to the Thomas–Fermi–Dirac equation of the statistical theory of the electron shell, can be derived. An approximation method for the solution of the equation obtained is outlined. In the case of (applied in the complete work) limitation on two body central forces, suitable nuclear terms for the nuclear forces can be established by adaptation of the empirical nuclear radius and the empirical binding energy. (tr-auth)

6756

THE SOURCES OF NUCLEAR ENERGY. Georges Gueben. Bull. sci. A.I.M. (Belg.), No. 2, 89-102(1955) Feb. (In French)

A general review on the various sources of nuclear energy and their historical development is given. (B.J.H.)

NUCLEAR PROPERTIES

6757 AEC-tr-2207

ANTIPROTON ANNIHILATION CROSS SECTIONS. I. Yu. Kobzarev. Translated by M. Hamermesh from Doklady Acad. Nauk S.S.S.R. 102, 1101-2(1955). 5p.

An abstract of this paper appears in Nuclear Science Abstracts as NSA 9-6435.

6758

GAMMA-RAYS FROM INELASTIC SCATTERING OF D-T NEUTRONS FROM CARBON 12 AND OXYGEN 16. L. E. Beghian, D. Hicks, and B. Milman (Clarendon Lab., Oxford, England). Phil Mag. (7), 46, 924-6(1955) Aug.

Neutrons of 14-Mev energy were scattered from C^{12} and O^{16}, and resultant γ spectra were observed. The C^{12} spectrum shows the presence of only a 4.4-Mev γ ray, and the O^{16} spectrum shows a γ ray at 6.1 Mev. (B.J.H.)

6759

DIMENSIONS OF NUCLEONS. Ya. Smorodinskii. Uspekhi Fiz. Nauk 56, 425-8(1955) July. (In Russian)

6760

INVESTIGATION OF THE ENERGY LEVELS OF LITHIUM NUCLEI BY THE METHOD OF MAGNETIC ANALYSIS. L. M. Khromchenko and V. A. Blinov (Radium Inst., Academy of Sciences S.S.S.R.). Zhur. Eksptl'. i Teoret. Fiz. 28, 741-3(1955) June. (In Russian)

6761

CALCULATION OF THE QUADRUPOLE MOMENT OF THE NUCLEUS BY ELECTRON SCATTERING. V. A. Myamlin (Moscow Engineering Physics Inst.). Zhur. Eksptl'. i Teoret. Fiz. 28, 756-8(1955) June. (In Russian)

6762

A STUDY OF NUCLEON FORCES WITH REPULSIVE CORES. I. THE EFFECT OF CORES OF FINITE STRENGTH. J. R. Bird and M. A. Preston (Univ. of Toronto, Ontario, Canada and McMaster Univ., Ontario, Canada). Can. J. Phys. 33, 399-406(1955) Aug.

A general study of nucleon potentials with repulsive cores has been made. Consideration is given to repulsions of finite strength and, for an exponential attractive potential and for the ^1S n – p system, it is shown to what accuracy the core may be replaced by an infinite one with a smaller radius. (auth)

6763

CAPTURE RADIATION AND NEUTRONS FROM THE BOMBARDMENT OF C^{14} WITH PROTONS. G. A. Bartholomew, F. Brown, H. E. Gove, A. E. Litherland, and E. B. Paul (Atomic Energy of Canada Ltd., Chalk River, Ontario). Can. J. Phys. 33, 441-56(1955) Aug.

The yield and angular distribution of ground state γ rays and of neutrons resulting from the proton bombardment of C^{14} have been studied for proton energies from 0.2 to 2.5 Mev. Assignments of spin and parity are made to most of the resonances observed in this range. A single particle proton state which may have isotopic spin 3/2 has been observed. The interference of this state, which has spin $1/2^+$, with a neighboring state of the same spin and parity is observed in the total yield of the ground state γ ray. Three states below the neutron threshold which have been observed previously in the $N^{14}(d,p)N^{15}$ reaction are also observed in the $C^{14}(p,\gamma)N^{15}$ reaction. The $N^{14}(n,p)C^{14}$ cross section at thermal energies can be accounted for by a resonance observed in this experiment, but another resonance below the neutron threshold must be assumed to account for the thermal (n,n) and (n,γ) cross sections. (auth)

6764

THE THERMAL NEUTRON CAPTURE CROSS SECTION OF Au^{198} AND THE HALF-LIFE OF Au^{199}. R. E. Bell, R. L. Graham, and L. Yaffe (Atomic Energy of Canada Ltd., Chalk River, Ontario). Can. J. Phys. 33, 457-65(1955) Aug.

The thermal neutron capture cross section of radioactive Au^{198} has been measured by the activation method as 26,000 ± 1200 barns, assuming 99 barns for the thermal neutron cross section of Au^{197}. Metallic Au^{197} was bombarded in fluxes up to 9×10^{13} thermal neutrons cm^{-2} sec^{-1} to produce a mixture of Au^{198} and Au^{199} by the successive neutron capture reactions $Au^{197}(n,\gamma)Au^{198}(n,\gamma)Au^{199}$. The ratio of the Au^{199} activity to Au^{198} activity so produced yields $\sigma_c(Au^{197})$. In a preliminary experiment, the half life of Au^{199} was measured as 3.148 ± 0.010 days. (auth)

6765

PURE NUCLEAR QUADRUPOLE SPECTRA OF CHLORINE AND ANTIMONY ISOTOPES IN SOLIDS. Tien-Chaun Wang (Columbia Univ., New York). Phys. Rev. 99, 566-77(1955) July 15.

Experimental measurements on nuclear quadrupole resonances of chlorine and antimony isotopes in solids have been made to an accuracy of about 0.001 percent. The results are compared in detail with theoretical results for (1) nuclear quadrupole interaction, (2) interaction between quadrupole coupling and thermal vibrations, and (3) effects of a nuclear hexadecapole. The ratio $(eQq)Cl^{35}/(eQq)Cl^{37}$ varies between 1.268736 and 1.268973 while $(eQq)Sb^{123}/(eQq)Sb^{121}$ varies from 1.274714 to 1.274770. These variations may be attributed to zero-point vibrations and to thermal vibrations, so that no clear evidence is found for nuclear polarization by

surrounding electric fields. For p-dichlorobenzene, the temperature coefficient of the coupling constant of Cl and the variation of isotopic coupling ratio with temperature are shown to be in fair quantitative agreement with the extension of Bayer's theory of vibrational effects. Relaxation times, Zeeman effects, and certain effects due to crystal structure are examined. Small discrepancies in the measured ratios of frequencies of transitions in Sb^{121} and Sb^{123}, which can be attributed to nuclear hexadecapole interactions are found. These indicate a hexadecapole coupling constant in Sb^{123} of 24 kc/sec and a ratio of the Sb^{123} hexadecapole coupling to that of Sb^{121} of 0.8 ± 0.3. A convenient high-sensitivity circuit for observation of nuclear resonances in solids has been developed and is discussed. (auth)

6766

ANGULAR CORRELATION OF PHOTONS FROM POSITRON ANNIHILATION IN SOLIDS. A. T. Stewart (Atomic Energy of Canada Ltd., Chalk River, Ontario). Phys. Rev. 99, 594-5(1955) July 15.

Measurements of the angular correlation of photons from positron annihilation in a series of solids were made. It was observed that the shape of the angular correlation curve varied considerably throughout a series of metals and that the momentum distribution of annihilating pairs shows a component of higher momentum in the heavier metals. Angular correlation in amorphous nonconductors shows a broad base and somewhat sharper peaks than in metals. (B.J.H.)

NUCLEAR REACTORS

6767 ANL-5424

Argonne National Lab., Lemont, Ill.

REACTOR ENGINEERING LECTURES. Stuart McLain. Mar. 1955. 366p. Contract W-31-109-eng-38.

Lectures are presented on applications of fluid flow, heat transfer, ore refining, metallurgy, mechanical design, remote handling, and process engineering to the preparation of materials, design, construction, operation, and utilization of the products of nuclear reactors. (C.W.H.)

6768

HOMOGENEOUS NUCLEAR REACTOR. R. Hurst (Atomic Energy Research Establishment, Harwell, Berks, England). Research 8, 301-6(1955) Aug.

Advantages and disadvantages of the homogeneous reactor as a power source are discussed. The greatest advantage is the possibility of continuous removal of fission products from the reactor, whereas problems of minimizing corrosion and contamination appear to be the chief disadvantages. Fluid fuel reactor development is outlined. (C.W.H.)

NUCLEAR TRANSFORMATION

6769 AEC-tr-2205

AN ATTEMPT TO DETECT H^4 NUCLEI AMONG FISSION PRODUCTS OF CARBON BY 300 MEV PROTONS. A. A. Reut, S. M. Korenchenko, V. V. Yur'ev, and B. M. Pontecorvo. Translated by S. D. Drell from Doklady Akad. Nauk S.S.S.R. 102, 723-5(1955). 7p.

An abstract of this paper appears in Nuclear Science Abstracts as NSA 9-6079.

6770

INTERACTION OF PROTONS WITH TRITIUM AND EXCITED STATES OF He^4. N. A. Vlasov, S. P. Kalinin, A. A. Ogloblin, L. N. Samoilov, V. A. Sidorov, and V. I. Chuev. Zhur Eksptl'. i Teoret. Fiz. 28, 639-50(1955) June. (In Russian)

Data on cross sections, angular distributions, etc. for the reactions $T(p,n)He^3$ and $T(p,\gamma)He^4$ for proton energies up to 7 Mev are presented. Characteristics of the excited states of He^4 are considered. (G.Y.)

6771

FISSION OF URANIUM NUCLEI BY SLOW π^- MESONS AND HIGH-ENERGY PARTICLES. G. E. Belovitskii, T. A. Romanova, L. V. Sukhov, and I. M. Frank (Lebedev Physics Inst.). Zhur. Eksptl'. i Teoret. Fiz. 28, 729-32(1955) June. (In Russian)

Emulsions loaded with $UO_2(C_2H_3O_2)_2$ were exposed to a π^- meson beam, to 460-, 180-, and 14-Mev neutron beams, and to 30-, 80-, and 250-Mev γ rays. Fissions observed are illustrated and discussed. 5 figures. (G.Y.)

6772

YIELD AND ANGULAR DISTRIBUTION OF HIGH-ENERGY PHOTONEUTRONS. P. S. Baranov and V. I. Gol'danskii (Lebedev Physics Inst.). Zhur. Eksptl'. i Teoret. Fiz. 28, 746-8(1955) June. (In Russian)

Data are plotted on angular distributions and cross sections of neutrons having greater than 30-Mev energy produced by exposing Li, Be, C, Al, Fe, Cu, and Pb to bremsstrahlung radiation of up to 250 Mev energy. (G.Y.)

6773

ON THE MULTIPHOTON ANNIHILATION OF HIGH-ENERGY POSITRONS BY ELECTRONS. A. A. Abrikosov (Inst. of Physical Problems). Doklady Akad. Nauk S.S.S.R. 102, 915-17(1955) June 11. (In Russian)

6774

THE CROSS SECTION FOR THE REACTION $B^{10}(p\alpha)Be^7$ AT PROTON ENERGIES BELOW 200 KEV. G. G. Bach and D. J. Livesey (Univ. of Birmingham, England). Phil. Mag. (7), 46, 824-30(1955) Aug.

The cross section for the reaction $B^{10}(p,\alpha)Be^7$ has been measured absolutely for proton energies of about 200 kev using magnetic analysis. Values of 0.92 ± 0.13, 0.66 ± 0.09, and 0.29 ± 0.04 mb were found for proton energies of 205, 200, and 180 kev, respectively. Cross sections relative to these values were obtained for proton energies down to 70 kev. (auth)

6775

CROSS SECTIONS FOR THE REACTION $C^{12}(\gamma 3\alpha)$ IN THE ENERGY RANGE 12-18 MEV. J. H. Carver, H. J. Hay, and E. W. Titterton (Australian National Univ., Canberra). Phil. Mag. (7), 46, 841-9(1955) Aug.

By combining results obtained from a methane counter with those from nuclear emulsions the cross sections for the $C^{12}(\gamma,3\alpha)$ reaction at 17.6, 14.8 and 12.3 Mev are found to be (1.70 ± 0.24), (0.33 ± 0.07) and (1.15 ± 0.6) × 10^{-28} cm^2, respectively. Analysis of the data suggests a strong resonance in the excitation function near 12.3 Mev and possible resonances near 15 and 16 Mev. (auth)

6776

AN INVESTIGATION OF THE NEUTRON GROUPS FROM THE DISINTEGRATION OF PHOSPHORUS BY 8 MEV DEUTERONS. F. A. El Bedewi (Univ. of Liverpool, England)

and M. A. El Wahab (Univ. of Alexandria, Egypt). Proc. Phys. Soc. London 68A, Pt. 8, 754-9(1955) Aug. 1.

The energy spectrum and angular distributions of some neutron groups emitted from the bombardment of a thin phosphorus target by 8-Mev deuterons have been investigated. The Q value of this reaction is found to be 6.63 ± 0.08 Mev. New excited states in S^{32} at 6.29, 7.28 and 8.23 Mev, with errors of ±0.10 Mev have been observed. Angular distributions of neutron groups corresponding to the transition to the ground state and two excited states at 2.25 Mev and 3.81 Mev in S^{32} are compared with theoretical curves calculated on the basis of Butler and Born approximation stripping theories. The angular momentum of the captured proton to these states is found to be 0, 2 and 0 respectively. In an appendix, R. Huby and H. C. Newns discuss the interpretation of these results on the shell model. (auth)

PARTICLE ACCELERATORS

6777 BNL-2426

Brookhaven National Lab., Upton, N. Y.

ABSOLUTE MEASUREMENT OF CYCLOTRON BEAM CURRENTS FOR RADIATION-CHEMICAL STUDIES. Robert H. Schuler and Augustine O. Allen. [1955]. 11p.

Characteristics are described for the collection of cyclotron beams in a conducting medium separated from the accelerator by an insulating window. The measured current can be interpreted in terms of an absolute beam current if charge displacement within the insulator is taken into account. Collection of the beam in this manner is particularly advantageous in a region external to the cyclotron magnetic field where stray currents due to air ionization and secondary electron emission are pronounced. A comparison is made between particle energies determined by the charge-input method and by calorimetry. A simplified arrangement for particle range determination is described. (auth)

6778 UCRL-1889(Rev.)

California. Univ., Berkeley. Radiation Lab.

A REPORT ON THE THREE-DEE, THREE-PHASE 20-INCH CYCLOTRON. M. Heusinkveld, M. Jakobson, L. Ruby, and B. T. Wright. Mar. 1955. Decl. June 30, 1955. 45p. Contract W-7405-eng-48.

The three-dee, three-phase 20-inch cyclotron was constructed for the purpose of investigating (a) the starting conditions of ions in a three-dee, three-phase accelerator, and (b) the problem of maintaining the correct phases between the dees. The 20-inch cyclotron has three dees which are 60° sections placed symmetrically in the tank. The rf system consists of a master oscillator and amplifier for each dee. The phases of the voltages on the dees are maintained at 120° with respect to each other by a phase control system. "Hunting" of the phase system has been eliminated by neutralizing the inter-dee capacity with inductively coupled loops on the dee stems. The machine was designed for proton resonance with a magnetic field of 7.1 kilogauss. Steady operation has been maintained with dee voltages of 28 kv and a proton beam of 6.5 ma at 1 Mev. Peak operation was 8.5 ma of protons at 1 Mev. The beam was measured both by a current probe and calorimetrically. It is possible to program the beam out to two complete turns by means of slits on the dees. The gain in energy per turn is between 2.5 and 3 ev_θ. Without changing the frequency of the electrical power supplied to the dees or changing the magnetic field, but by changing the phase sequence from ABC to ACB, 6 ma of deuterons have been accelerated to a full radius of 8-½ inches (0.5 Mev) with an energy gain per turn of ~5 ev_θ. (auth)

6779

THE ONE MEV GENERATOR AND THE ION ACCELERATOR OF THE CENTRE DE PHYSIQUE NUCLEAIRE DE LIEGE. Maurice Guegen. Bull. sci. A.I.M. (Belg.), No. 1, 39-64(1954) Jan. (In French)

The 1 Mev ion accelerator at the Centre de Physique Nucléaire de Liège is described in detail, including the components and the operating characteristics of the apparatus. Its possible uses are also discussed. (B.J.H.)

6780

EFFECT OF SPACE CHARGE DURING PROPAGATION OF INTENSE BEAMS OF CHARGED PARTICLES. M. D. Gabovich. Uspekhi Fiz. Nauk 56, 215-56(1955) June. (In Russian)

A review. 81 references. (G.Y.)

6781

ACCELERATION OF PROTONS TO HIGH ENERGIES. W. Walkinshaw (Atomic Energy Research Establishment, Harwell, Berks, England). Research 8, 295-300(1955) Aug.

Several high-energy proton accelerators are described and fundamental principles of their operation are outlined. The synchrocyclotron and proton linear accelerator are mentioned specifically. (C.W.H.)

6782

AN ALIGNMENT PROCEDURE FOR AN ELECTROSTATIC ANALYZER. R. Ray Weeks (Argonne National Lab., Lemont, Ill.). IRE Trans. Nuclear Sci. NS-2, 12-13(1955) June.

A procedure is described which electrically checks the entrance and exit tangents of an electrostatic analyzer. Audio frequency modulation of the direction of the incident beam is used to fill the aperture of the analyzer. Alignment adjustments may be made while observing signals delivered to oscilloscopes. (auth)

RADIATION ABSORPTION AND SCATTERING

6783 NRL-4581

Naval Research Lab., Washington, D. C.

PENETRATION OF Na^{24} RADIATION THROUGH H_2O AND Hg. Interim Report. L. A. Beach, R. B. Theus, and W. R. Faust. June 24, 1955. 4p. Project Nos. NR.644-020 and NS-200-025.

The dose rate as a function of penetration distance was measured for a point isotropic Na^{24} γ-ray source in water and in mercury. The experimental results agreed with dose rates predicted by moment method calculations. (auth)

6784 UCRL-3061

California. Univ., Berkeley. Radiation Lab.

A TABLE OF DISPERSION CORRECTIONS FOR X-RAY SCATTERING OF ATOMS. Carol H. Dauben and David H. Templeton. June 2, 1955. 10p. Contract W-7405-eng-48.

Values are tabulated for the real and imaginary dispersion corrections for the x-ray scattering factors for elements 20 to 96 for K_α radiation of chromium, copper, and molybdenum. (auth)

6785 AEC-tr-2209

ENERGY THRESHOLDS FOR THE BREAK-UP OF HEAVY NEGATIVE IONS IN COLLISIONS WITH HELIUM ATOMS. V. M. Dukel'skii and E. Ya. Zandberg. Translated from Zhur. Eksptl'. i Teoret. Fiz. 24, 339-41(1953). 3p. Available from Associated Technical Services (Trans. 57G6R), East Orange, N. J.

An abstract of this paper appears in Nuclear Science Abstracts as NSA 8-6211.

6786

THE CHROMATIC ERROR IN SMALL-ANGLE X-RAY SCATTERING ANALYSIS. Katarina Kranjc. Soc. Sci. Nat. Croat. Period. Math.-Phys. et Astron., Ser. II 9, No. 3-4, 167-76(1954). (In Croatian)

A method of investigating the influence of chromatic error in small-angle x-ray scattering analysis on the shape of the scattering curve is considered. The method consists of computing scattered radiation intensities contributed by each wave length for a particular scattering angle and performing summations of these intensities for various scattering angles. It is concluded that this method of investigation is useful if the function $I_0(\lambda)$, the spectral energy distribution in the primary radiation, is accurately known. (B.J.H.)

6787

THE COLLIMATION ERROR OF CIRCULAR APERTURES IN SMALL-ANGLE X-RAY SCATTERING. Katarina Kranjc. Soc. Sci. Nat. Croat. Period. Math.-Phys. et Astron., Ser. II 9, No. 3-4, 179-90(1955). (In English)

The collimation error produced by the experimental arrangement for recording scattered x rays is considered for a collimator of two circular apertures. (B.J.H.)

6788

RANGE OF PROTONS IN MEDIUM AND HEAVY ELEMENTS. B. V. Rybakov. Zhur. Eksptl'. i Teoret. Fiz. 28, 651-4(1955) June. (In Russian)

Measurements of the Al equivalent of the range of 1- to 7-Mev protons in Fe, Cu, Mo, Cd, Sn, Ta, and Pb are tabulated and graphed. (G.Y.)

6789

PRODUCTION OF NEGATIVE HYDROGEN IONS BY PASSAGE OF PROTONS ACROSS THIN METALLIC FOILS. Ya. M. Fogel, B. G. Safronov, and L. I. Krupnik (Physico-Technical Inst., Academy of Sciences, Ukrainian S.S.R.). Zhur. Eksptl'. i Teoret. Fiz. 28, 711-18(1955) June. (In Russian)

Ratios of H^- to H^+ ions produced by 11.5- to 28-kev protons traversing Be, Al, and Cu foils were measured. Graphs and tabulations are presented. (G.Y.)

6790

PROTON-PROTON ELASTIC SCATTERING AT 950 MEV. P. J. Duke, W. O. Lock, P. V. March (Univ. of Birmingham, England), W. M. Gibson, R. McKeague (Queen's Univ., Belfast, Ireland), I. S. Hughes, and H. Muirhead (Univ. of Glasgow, Scotland). Phil. Mag. (7), 46, 877-83(1955) Aug.

Ilford G5 emulsions exposed to a 950 Mev proton beam from the Birmingham synchrotron, have been searched for proton–proton elastic collisions. Forty-six such events have been found in 950 meters of proton track, equivalent to a cross section for elastic scattering of 15.5 ± 2.5 mb. The angular distribution of the scattered protons in the center-of-mass system shows a strong forward peak in agreement with results obtained at Brookhaven by cloud chamber and counter workers. (auth)

6791

MULTIPLE SCATTERING OF LOW-ENERGY ALPHA PARTICLES IN A GAS. G. Allen, R. Webeler, and S. Barile (Lewis Flight Propulsion Lab., Cleveland). Phys. Rev. 99, 556-8(1955) July 15.

Alpha particles from a polonium source were slowed down and allowed to enter a cloud chamber containing a mixture of hydrogen, water, and ethyl alcohol at pressures of 12.25 cm, 1.50 cm, and 2.25 cm, respectively, during the sensitive time. Eighty-four sharp tracks of particles which stopped in the illuminated part of the chamber and which did not show any sharp bends due to single scattering were selected for study. Starting at the termini of the projected tracks, the angles between successive chords of three millimeters length were measured, the energies at the first three intersections of the chords being approximately 18, 45, and 85 kev. The magnitudes of the angles at which the tails of the distributions could be distinguished from the Gaussian parts were determined to be 10°, 6° to 8°, and 4°, respectively. The total standard deviations (which included the experimental error of 2.2°) for the Gaussian part of the distributions at these energies were 8.0°, 4.3°, and 3.0°, respectively, so that the standard deviations due to multiple scattering were, respectively, 7.7°, 3.7°, and 2.0°. (auth)

6792

TEMPERATURE EFFECTS IN THE ANNIHILATION OF POSITRONS. Robert T. Wagner and Frank L. Hereford (Univ. of Virginia, Charlottesville). Phys. Rev. 99, 593-4 (1955) July 15.

An investigation was made of the effects of reduced temperature in several substances, including methyl alcohol, water, and glycerine, on the anomalously long lived positron component in these substances. Most significantly, the data indicate that the temperature effect occurs only after solidification. (B.J.H.)

6793

MEASUREMENT OF ELECTRON MOMENTUM BY POSITRON ANNIHILATION. G. Lang, S. DeBenedetti, and R. Smoluchowski (Carnegie Inst. of Tech., Pittsburgh). Phys. Rev. 99, 596-8(1955) July 15.

The angular distribution of γ rays from positron annihilation in various metals was observed, and typical curves are shown. The momentum distribution of the annihilating pairs corresponds closely to that of a Fermi gas. (B.J.H.)

6794

EFFECT OF ELECTRON MASS ON HIGH ENERGY ELECTRON SCATTERING. L. R. B. Elton (King's Coll., London, England). Proc. Phys. Soc. London 68A, Pt. 8, 741-5(1955) Aug. 1.

The effect of the electron mass on the differential cross section for the scattering of high-energy electrons by atomic nuclei is investigated. It is shown that it is negligible for point nuclei above 5 Mev. The effect on the scattering by extended nuclei is more difficult to estimate, but is almost certainly negligible in the 100 to 200 Mev region. (auth)

6795

THE SCATTERING OF NUCLEONS BY ALPHA PARTICLES — DETERMINATION OF THE SPIN-ORBIT INTERACTION. S. Hochberg, H. S. W. Massey, H. Robertson, and L. H. Underhill (University College, London, England). Proc. Phys. Soc. London 68A, Pt. 8, 746-53(1955) Aug 1.

The p-phases for the scattering of neutrons by α particles have been calculated by the resonating group structure

method. The phase shifts were calculated from the integro-differential equations using the Pilot ACE electronic computer at the National Physical Laboratory, Teddington. Values of the d phases have also been obtained for neutron energies up to 16 Mev. (auth)

RADIATION EFFECTS

6796

ELECTRICAL CONDUCTIVITY INDUCED IN MgO CRYSTALS BY 1.3-MEV ELECTRON BOMBARDMENT. M. A. Pomerantz, R. A. Shatas, and J. F. Marshall (Bartol Research Foundation, Swarthmore, Penna.). Phys. Rev. 99, 489-90(1955) July 15.

Currents induced by the passage of a pulsed beam of essentially monoenergetic 1.3-Mev electrons through thin single crystals of MgO have been observed. The bombardment-induced current is proportional to the applied voltage in accordance with theoretical expectation. The lifetime of the charge carriers before trapping is approximately 3×10^{-11} sec. (auth)

6797

ANNEALING PROCESS IN NEUTRON-IRRADIATED LiF. D. Binder and W. J. Sturm (Oak Ridge National Lab., Tenn.). Phys. Rev. 99, 603-4(1955) July 15.

An exact order, an activation energy, and a jump frequency for the lattice defects causing expansion are derived by analyzing the annealing data for uniformly neutron-irradiated LiF crystals. (B.J.H.)

RADIOACTIVITY

6798

THE DECAY OF COBALT 57. H. R. Lemmer, O. J. A. Segaert, and M. A. Grace (Clarendon Lab., Oxford, England). Proc. Phys. Soc. London 68A, Pt. 8, 701-8(1955) Aug. 1.

The x and γ radiations excited during the decay of Co^{57} have been investigated with scintillation and proportional counters. These measurements showed that the 14.4 ± 0.1 kev γ ray follows the 123 kev γ ray with a half life of 1.0 ± 0.1 × 10^{-7} sec and that its internal conversion coefficient (α_{total}) is 15 ± 1. No evidence for β+ emission with an intensity greater than $^1/_{1200}$ per disintegration was found and upper limits of about 14% were set on the number of disintegrations proceeding directly to the ground and first excited states of Fe^{57}. Spin and parity assignments are suggested. (auth)

6799

THE DECAY OF RaD AND THE 46.5 keV EXCITED STATE OF RaE. G. M. Lewis (Univ. of Glasgow, Scotland). Proc. Phys. Soc. London 68A, Pt. 8, 735-40(1955) Aug. 1.

The lifetime of the 46.5 kev excited state following β decay of RaD has been shown, by delayed coincidence methods, to be less than 3×10^{-9} sec; this specifies the 46.5 kev transition to be a dipole one. An investigation of the scintillations from an activated NaI crystal containing RaD has determined the complete integrated spectrum of RaD, free from effects of source absorption. This spectrum consists in the main of a single peak, and indicates directly that at least 90% of the disintegrations involve soft β decay to the 46.5 kev excited state followed by rapid de-excitation. Less than 5% of the disintegrations pass through metastable states. The β decay is briefly discussed. (auth)

6800

DECAY OF As^{70} PRODUCED BY N^{14} BOMBARDMENT OF Cu. A. E. Souch (Univ. of Birmingham, England). Proc. Phys. Soc. London 68A, Pt. 8, 760-1(1955) Aug. 1.

Cu was bombarded with N^{14} ions in the 60-inch Nuffield cyclotron to produce As which was chemically separated by precipitating as $MgNH_4AsO_4$. Decay curves indicated the presence of As^{70} and As^{74}. The β spectrum was investigated with a focusing spectrometer and energies of 2.45 and 1.35 Mev were established; relative abundance was 33 and 67%, respectively. The mean γ energy of 1.07 ± 0.04 Mev was in agreement with the β energy difference. (D.E.B.)

6801

EXCITATION OF ROTATIONAL LEVELS IN ALPHA DECAY. V. G. Nosov. Doklady Akad. Nauk. S.S.S.R. 103, 65-7(1955) July 1. (In Russian)

6802

DISTRIBUTION OF PROTONS IN HEAVY ATOMIC NUCLEI. P. Mittelstaedt (Max-Planck-Institut für Physik, Göttingen, Germany.). Z. Naturforsch. 10a, 379-83(1955) May.

6803

INTENSITY MEASUREMENT OF ENERGY RICH γ RAYS OF RaC'. G. Backenstoss and K. Wohlleben (Universitat Freiburg, Germany.). Z. Naturforsch. 10a, 384-6(1955) May.

With the aid of a gamma spectrometer, the intensity ratios of γ lines of 1.76, 2.20, and 2.42 Mev of 3.22 : 1.00 : 0.48 were determined. By comparison with the known number of 2.62-Mev γ quanta of ThC", the number of 2.42-Mev γ quanta of RaC' of (8.9 ± 0.5) × 10^5/mg Ra.sec. is indicated. (tr-auth)

6804

CONTAMINATION OF SURFACES BY RADIOACTIVE MATERIALS: THE DERIVATION OF MAXIMUM PERMISSIBLE LEVELS. H. J. Dunster (Atomic Energy Research Establishment, Harwell, Berks, England). Atomics 6, 233-9, 250 (1955) Aug.

6805

PRESENT STATE OF β DECAY THEORY. Ya. B. Zel'dovich. Uspekhi Fiz. Nauk 56, 165-200(1955) June. (In Russian)

A review. 89 references. (G.Y.)

6806

BETA DECAY OF LIGHT NUCLEI. Ya. Smorodinskii. Uspekhi Fiz. Nauk 56, 201-14(1955) June. (In Russian)

A review. 33 references. (G.Y.)

SPECTROSCOPY

6807 NP-5732

Columbia Univ., New York. Columbia Radiation Lab. RESEARCH EXTENDING THE USEFUL RANGE OF THE ELECTROMAGNETIC SPECTRUM. Collected Papers on the MASER (Microwave Amplification by Stimulated Emission of Radiation). July 1, 1955. 87p. DA Project No. 3-99-10-022. Contract DA-36-039-SC-42519. (CU-11-55-SC-42519-Phys.)

Collected papers on the development of microwave devices and their application to physical research are presented. A molecular microwave spectrometer, oscillator, or amplifier, the Maser, is described in detail and used to study the hyperfine structure of the $N^{14}H_3$ J = K = 3 inversion transition. (B.J.H.)

THEORETICAL PHYSICS

6808 RDB(R)-8140

United Kingdom Atomic Energy Authority. Industrial Group H. Q., Risley, Lancs, England.

UPPER AND LOWER BOUNDS FOR THE CRITICAL LAPLACIAN AND CRITICAL SIZE OF AN INFINITE ELLIPTICAL CYLINDER. R. T. Ackroyd and J. M. Ball. July 5, 1955. 26p. (WHC(C)/P37)

Upper and Lower Bounds are constructed for the critical Laplacian (according to one-group diffusion theory) of an infinitely long cylinder of elliptical cross-section. For simplicity in the reflected case the diffusion coefficients for the cylinder and the reflector are taken to be the same. Charts are given for reading off at a glance upper and lower bounds for the critical Laplacian for bare and reflected cylinders of given dimensions. Sometimes the problem is to determine the critical dimensions of the cylinder for a given Laplacian. As an example a chart is given for determining by inspection upper and lower bounds for one dimension of a critical bare elliptical cylinder to within ±5% when given the other. (auth)

6809 AEC-tr-2200

EXPRESSION FOR THE INTERACTION OF A SYSTEM OF PARTICLES WITH THE ELECTROMAGNETIC FIELD. Yu K. Khokhlov. Translated from Zhur. Eksptl'. i Teoret. Fiz. 26, 576-84(1954). 9p. Available from Associated Technical Services (Trans. 31G6R), East Orange, N. J.

It is shown that the interaction of a system of particles with the electromagnetic field may be expressed directly in terms of field intensities independently of the gauge of the potentials. A general definition of multipole moments is given, and their application to radiative transitions is investigated. (auth)

6810 AEC-tr-2203

THE THEORY OF TRANSPORT EQUATIONS IN STRONG ELECTRIC FIELDS. PART I. G. M. Avak'yants. Translated from Zhur. Eksptl'. i Teoret. Fiz. 26, 562-75(1954). 16p. Available from Associated Technical Services (Trans. 30G6R), East Orange, N. J.

The transport of heat and electric charge in semiconductors is investigated under the conditions when the electron (or hole) gas of the semiconductor is strongly heated in the electric field associated with the flow of current through the semiconductor. The equations for heat and electric flow are obtained in a form which permits taking into account the heating of electrons (or holes) in the external electric field. On the basis of these equations general formulae are obtained for the thermoelectric and the galvanomagnetic effects. (auth)

6811

LOW-FIELD MAGNETIC RESONANCE. M. A. Garstens and J. I. Kaplan (Naval Research Lab., Washington, D. C.). Phys. Rev. 99, 459-63(1955) July 15.

Low-field magnetic resonance has been investigated for linearly and circularly polarized radio-frequency radiation for both the saturated and unsaturated case using modified Bloch equations for both. For the circularly polarized case, a quantum-mechanical solution is presented. Experimental verification for the linearly polarized case has been obtained. (auth)

6812

ANISOTROPY OF BREMSSTRAHLUNG AND PAIR PRODUCTION IN SINGLE CRYSTALS. F. J. Dyson (Institute for Advanced Study, Princeton, N. J.) and H. Uberall (Cornell Univ., Ithaca, N. Y.). Phys. Rev. 99, 604-5(1955) July 15.

Modifications to the Bethe-Heitler formulas for bremsstrahlung and pair production for electrons and photons are discussed. (B.J.H.)

6813

ON CONSTRUCTION OF SCATTERING MATRICES IN QUANTUM THEORY OF FIELDS WITH NONLOCAL INTERACTIONS. B. V. Medvedev (Steklov Mathematics Inst.). Doklady Akad. Nauk S.S.S.R. 103, 37-40(1955) July 1. (In Russian)

6814

SCATTERING OF FAST NEUTRONS BY NONSPHERICAL NUCLEI. I and II. S. I. Drozdov. Zhur. Eksptl'. i Teoret. Fiz. 28, 734-8(1955) June. (In Russian)

6815

ON THE ASYMPTOTIC GREEN FUNCTION IN QUANTUM ELECTRODYNAMICS. E. S. Fradkin (Lebedev Physics Inst.). Zhur Eksptl'. i Teoret. Fiz. 28, 750-2(1955) June. (In Russian)

6816

EQUATIONS OF STATE OF ELEMENTS FROM THE THOMAS-FERMI THEORY. N. H. March (Univ. of Sheffield, England). Proc. Phys. Soc. London 68A, Pt. 8, 726-34(1955) Aug. 1.

An investigation of the equations of state of elements as given by the Thomas–Fermi theory has been carried out in a region corresponding to higher pressures than have hitherto been discussed in detail. Both analytical and numerical methods have been used. The results thus obtained suggest modifications to be made in the recent formulae given by Gilvarry, who fitted the available numerical data with functions having the correct limiting forms. The introduction of exchange is also considered and the modifications thus caused are exhibited explicitly for very high pressures (auth)